ABBEYCONSULTANTS

Appendix F Part 3

BE GREEN SAP CALCULATIONS

217 High Street Yiewsley

Taylor Wimpey West London

Appendix to report No: PA-ES-YHS-TWWL-20-02

Report Date: July 2020

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:04

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.18m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 2 GF

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.28 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.46m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 2 GF

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.18	(1a) x	2.55	(2a) =	135.61	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.18	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		135.61	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.46	x	1/[1/(1.2)+ 0.04]	=	11.98			(27)
Floor			53.18	x	0.12	=	6.3816	75	3988.5	(28)
Walls Type1	36.03	10.46	25.57	x	0.17	=	4.35	14	357.98	(29)
Walls Type2	9.56	2.1	7.46	x	0.21	=	1.56	30	223.8	(29)
Total area of elements, m²			98.77							(31)
Party wall			28.97	x	0	=	0	20	579.4	(32)
Party ceiling			53.18					30	1595.4	(32b)
Internal wall **			97.64					9	878.76	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.42 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7623.84 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 143.36 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.64 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.06 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	22.46	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	56.52	56.43	56.43	56.43	56.43	56.43	56.43	56.43	56.43	56.43	56.43	56.43	

Average = Sum(39)$_{1...12}$ /12= 56.44 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06

Average = Sum(40)$_{1...12}$ /12= 1.06 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.78 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.57 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	84.22	81.16	78.1	75.04	71.97	68.91	68.91	71.97	75.04	78.1	81.16	84.22

Total = Sum(44)$_{1...12}$ = 918.8 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	124.9	109.24	112.73	98.28	94.3	81.37	75.4	86.53	87.56	102.04	111.39	120.96

Total = Sum(45)$_{1...12}$ = 1204.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.74	16.39	16.91	14.74	14.14	12.21	11.31	12.98	13.13	15.31	16.71	18.14

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	

Output from water heater (annual)$_{1...12}$ 1855.53 (64)

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

(65)m=	85.75	76.26	81.7	75.47	75.58	69.85	69.29	72.99	71.91	78.15	79.83	84.44	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	(66)

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

(67)m=	13.86	12.31	10.01	7.58	5.67	4.78	5.17	6.72	9.02	11.45	13.36	14.24	(67)

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

(68)m=	155.48	157.1	153.03	144.38	133.45	123.18	116.32	114.71	118.77	127.43	138.35	148.62	(68)

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

(69)m=	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	(71)

Water heating gains (Table 5)

(72)m=	115.26	113.49	109.82	104.82	101.58	97.02	93.14	98.11	99.87	105.04	110.88	113.5	(72)

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

(73)m=	334.36	332.65	322.62	306.54	290.45	274.74	264.38	269.29	277.42	293.68	312.35	326.12	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.46	x	36.79	x	0.48	x	0.8	=	102.42	(77)
Southeast 0.9x	0.77	x	10.46	x	62.67	x	0.48	x	0.8	=	174.45	(77)
Southeast 0.9x	0.77	x	10.46	x	85.75	x	0.48	x	0.8	=	238.7	(77)
Southeast 0.9x	0.77	x	10.46	x	106.25	x	0.48	x	0.8	=	295.75	(77)
Southeast 0.9x	0.77	x	10.46	x	119.01	x	0.48	x	0.8	=	331.27	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	10.46	x	118.15	x	0.48	x	0.8	=	328.87	(77)
Southeast 0.9x	0.77	x	10.46	x	113.91	x	0.48	x	0.8	=	317.07	(77)
Southeast 0.9x	0.77	x	10.46	x	104.39	x	0.48	x	0.8	=	290.57	(77)
Southeast 0.9x	0.77	x	10.46	x	92.85	x	0.48	x	0.8	=	258.46	(77)
Southeast 0.9x	0.77	x	10.46	x	69.27	x	0.48	x	0.8	=	192.81	(77)
Southeast 0.9x	0.77	x	10.46	x	44.07	x	0.48	x	0.8	=	122.67	(77)
Southeast 0.9x	0.77	x	10.46	x	31.49	x	0.48	x	0.8	=	87.65	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	102.42	174.45	238.7	295.75	331.27	328.87	317.07	290.57	258.46	192.81	122.67	87.65	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	436.78	507.11	561.31	602.29	621.72	603.61	581.45	559.86	535.88	486.48	435.02	413.77	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.9	0.82	0.71	0.55	0.41	0.45	0.64	0.84	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.57	19.82	20.14	20.49	20.77	20.93	20.98	20.97	20.88	20.52	19.97	19.5	(87)

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

(88)m=	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.88	0.79	0.66	0.48	0.33	0.36	0.57	0.81	0.93	0.96	(89)

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

(90)m=	18.15	18.5	18.95	19.43	19.79	19.97	20.02	20.02	19.92	19.48	18.73	18.05	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.8	19.11	19.5	19.92	20.24	20.41	20.46	20.46	20.36	19.96	19.3	18.72	(92)

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

(93)m=	18.8	19.11	19.5	19.92	20.24	20.41	20.46	20.46	20.36	19.96	19.3	18.72	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.87	0.79	0.67	0.51	0.37	0.4	0.6	0.81	0.92	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	412.8	464.17	487.6	475.89	416.89	309.12	213.55	222.96	320.28	393.43	398.29	394.15	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	819.66	801.68	733.62	621.87	482.03	328.03	218	228.98	353.35	528.2	688.51	819.46	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	302.71	226.81	183.04	105.1	48.46	0	0	0	0	100.27	208.96	316.43	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1491.78	(98)
Space heating requirement in kWh/m²/year		28.05	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1491.78	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1566.37	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1855.53	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1948.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.15	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		40.05	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	40.05	(331)
Energy for lighting (calculated in Appendix L)		244.77	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	715.34	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.24	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	733.58	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			733.58	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	20.78	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	127.03	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			759.43	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.28	(384)
EI rating (section 14)				89.63	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:50

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.18m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 2 TF

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	30.34 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.82 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.46m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 2 TF

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.18 (1a)	x	2.55 (2a)	=	135.61	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.18 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	135.61	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.46	x	1/[1/(1.2)+ 0.04]	=	11.98			(27)
Walls Type1	36.03	10.46	25.57	x	0.17	=	4.35	14	357.98	(29)
Walls Type2	9.56	2.1	7.46	x	0.21	=	1.56	30	223.8	(29)
Roof	53.18	0	53.18	x	0.13	=	6.91	9	478.62	(30)
Total area of elements, m²			98.77							(31)
Party wall			28.97	x	0	=	0	20	579.4	(32)
Party floor			53.18					70	3722.6	(32a)
Internal wall **			97.64					9	878.76	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.95 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6241.16 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 117.36 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.45 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.4 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	22.46	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.86	58.78	58.78	58.78	58.78	58.78	58.78	58.78	58.78	58.78	58.78	58.78	

Average = Sum(39)$_{1...12}$ /12= 58.78 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11

Average = Sum(40)$_{1...12}$ /12= 1.11 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.78 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.57 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	84.22	81.16	78.1	75.04	71.97	68.91	68.91	71.97	75.04	78.1	81.16	84.22

Total = Sum(44)$_{1...12}$ = 918.8 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	124.9	109.24	112.73	98.28	94.3	81.37	75.4	86.53	87.56	102.04	111.39	120.96

Total = Sum(45)$_{1...12}$ = 1204.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.74	16.39	16.91	14.74	14.14	12.21	11.31	12.98	13.13	15.31	16.71	18.14

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	

Output from water heater (annual)$_{1...12}$ 1855.53 (64)

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

(65)m=	85.75	76.26	81.7	75.47	75.58	69.85	69.29	72.99	71.91	78.15	79.83	84.44	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	(66)

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

(67)m=	13.86	12.31	10.01	7.58	5.67	4.78	5.17	6.72	9.02	11.45	13.36	14.24	(67)

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

(68)m=	155.48	157.1	153.03	144.38	133.45	123.18	116.32	114.71	118.77	127.43	138.35	148.62	(68)

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

(69)m=	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	(71)

Water heating gains (Table 5)

(72)m=	115.26	113.49	109.82	104.82	101.58	97.02	93.14	98.11	99.87	105.04	110.88	113.5	(72)

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

(73)m=	334.36	332.65	322.62	306.54	290.45	274.74	264.38	269.29	277.42	293.68	312.35	326.12	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.46	x	36.79	x	0.48	x	0.8	=	102.42	(77)
Southeast 0.9x	0.77	x	10.46	x	62.67	x	0.48	x	0.8	=	174.45	(77)
Southeast 0.9x	0.77	x	10.46	x	85.75	x	0.48	x	0.8	=	238.7	(77)
Southeast 0.9x	0.77	x	10.46	x	106.25	x	0.48	x	0.8	=	295.75	(77)
Southeast 0.9x	0.77	x	10.46	x	119.01	x	0.48	x	0.8	=	331.27	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	10.46	x	118.15	x	0.48	x	0.8	=	328.87	(77)
Southeast 0.9x	0.77	x	10.46	x	113.91	x	0.48	x	0.8	=	317.07	(77)
Southeast 0.9x	0.77	x	10.46	x	104.39	x	0.48	x	0.8	=	290.57	(77)
Southeast 0.9x	0.77	x	10.46	x	92.85	x	0.48	x	0.8	=	258.46	(77)
Southeast 0.9x	0.77	x	10.46	x	69.27	x	0.48	x	0.8	=	192.81	(77)
Southeast 0.9x	0.77	x	10.46	x	44.07	x	0.48	x	0.8	=	122.67	(77)
Southeast 0.9x	0.77	x	10.46	x	31.49	x	0.48	x	0.8	=	87.65	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	102.42	174.45	238.7	295.75	331.27	328.87	317.07	290.57	258.46	192.81	122.67	87.65	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	436.78	507.11	561.31	602.29	621.72	603.61	581.45	559.86	535.88	486.48	435.02	413.77	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.95	0.92	0.88	0.81	0.7	0.55	0.42	0.45	0.64	0.83	0.92	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.25	19.52	19.89	20.3	20.65	20.87	20.96	20.95	20.8	20.35	19.72	19.17	(87)

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

(88)m=	20	20	20	20	20	20	20	20	20	20	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.91	0.86	0.78	0.65	0.49	0.33	0.36	0.57	0.79	0.91	0.95	(89)

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

(90)m=	17.68	18.07	18.59	19.16	19.62	19.89	19.97	19.96	19.81	19.24	18.36	17.57	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.4	18.74	19.19	19.69	20.1	20.34	20.43	20.42	20.27	19.76	18.98	18.31	(92)

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

(93)m=	18.4	18.74	19.19	19.69	20.1	20.34	20.43	20.42	20.27	19.76	18.98	18.31	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.92	0.89	0.84	0.77	0.66	0.51	0.37	0.4	0.59	0.78	0.89	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	403.27	451.56	472.93	461.84	408.02	308.01	216.45	225.17	315.81	381.54	387.47	385.62	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	829.92	813.32	745.89	634.13	493.54	337.45	224.88	236.06	362.5	538.12	698.4	829.29	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	317.43	243.1	203.08	124.05	63.63	0	0	0	0	116.5	223.87	330.09	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1621.75	(98)
Space heating requirement in kWh/m²/year		30.5	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1621.75	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1702.84	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1855.53	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1948.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	36.51	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		40.05	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	40.05	(331)
Energy for lighting (calculated in Appendix L)		244.77	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	743.12	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.95	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	762.07	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			762.07	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	20.78	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	127.03	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			787.92	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.82	(384)
EI rating (section 14)				89.25	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:50:19

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.18m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 2

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.26 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.24 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	30.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.46m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 2

Address : P 1 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.18 (1a)	x	2.55 (2a)	=	135.61	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.18 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	135.61	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.46	x1/[1/(1.2)+ 0.04]		=	11.98			(27)
Walls Type1	36.03	10.46	25.57	x	0.17	=	4.35	14	357.98	(29)
Walls Type2	9.56	2.1	7.46	x	0.21	=	1.56	30	223.8	(29)
Total area of elements, m²			45.59							(31)
Party wall			28.97	x	0	=	0	20	579.4	(32)
Party floor			53.18					70	3722.6	(32a)
Party ceiling			53.18					30	1595.4	(32b)
Internal wall **			97.64					9	878.76	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 21.04 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7357.94 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 138.36 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.15 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 24.19 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	22.46	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	22.38	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.65	46.57	46.57	46.57	46.57	46.57	46.57	46.57	46.57	46.57	46.57	46.57	

Average = Sum(39)$_{1...12}$ /12= 46.57 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88

Average = Sum(40)$_{1...12}$ /12= 0.88 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.78 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.57 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	84.22	81.16	78.1	75.04	71.97	68.91	68.91	71.97	75.04	78.1	81.16	84.22

Total = Sum(44)$_{1...12}$ = 918.8 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	124.9	109.24	112.73	98.28	94.3	81.37	75.4	86.53	87.56	102.04	111.39	120.96

Total = Sum(45)$_{1...12}$ = 1204.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.74	16.39	16.91	14.74	14.14	12.21	11.31	12.98	13.13	15.31	16.71	18.14

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.18	159.17	168	151.77	149.58	134.87	130.68	141.8	141.05	157.32	164.88	176.24	

Output from water heater (annual)$_{1...12}$ 1855.53 (64)

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

(65)m=	85.75	76.26	81.7	75.47	75.58	69.85	69.29	72.99	71.91	78.15	79.83	84.44	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	89.19	(66)

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

(67)m=	13.86	12.31	10.01	7.58	5.67	4.78	5.17	6.72	9.02	11.45	13.36	14.24	(67)

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

(68)m=	155.48	157.1	153.03	144.38	133.45	123.18	116.32	114.71	118.77	127.43	138.35	148.62	(68)

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

(69)m=	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	-71.35	(71)

Water heating gains (Table 5)

(72)m=	115.26	113.49	109.82	104.82	101.58	97.02	93.14	98.11	99.87	105.04	110.88	113.5	(72)

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

(73)m=	334.36	332.65	322.62	306.54	290.45	274.74	264.38	269.29	277.42	293.68	312.35	326.12	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.46	x	36.79	x	0.48	x	0.8	=	102.42	(77)
Southeast 0.9x	0.77	x	10.46	x	62.67	x	0.48	x	0.8	=	174.45	(77)
Southeast 0.9x	0.77	x	10.46	x	85.75	x	0.48	x	0.8	=	238.7	(77)
Southeast 0.9x	0.77	x	10.46	x	106.25	x	0.48	x	0.8	=	295.75	(77)
Southeast 0.9x	0.77	x	10.46	x	119.01	x	0.48	x	0.8	=	331.27	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	10.46	x	118.15	x	0.48	x	0.8	=	328.87	(77)
Southeast 0.9x	0.77	x	10.46	x	113.91	x	0.48	x	0.8	=	317.07	(77)
Southeast 0.9x	0.77	x	10.46	x	104.39	x	0.48	x	0.8	=	290.57	(77)
Southeast 0.9x	0.77	x	10.46	x	92.85	x	0.48	x	0.8	=	258.46	(77)
Southeast 0.9x	0.77	x	10.46	x	69.27	x	0.48	x	0.8	=	192.81	(77)
Southeast 0.9x	0.77	x	10.46	x	44.07	x	0.48	x	0.8	=	122.67	(77)
Southeast 0.9x	0.77	x	10.46	x	31.49	x	0.48	x	0.8	=	87.65	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	102.42	174.45	238.7	295.75	331.27	328.87	317.07	290.57	258.46	192.81	122.67	87.65	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	436.78	507.11	561.31	602.29	621.72	603.61	581.45	559.86	535.88	486.48	435.02	413.77	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.95	0.92	0.86	0.77	0.64	0.48	0.35	0.38	0.56	0.8	0.92	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.93	20.16	20.44	20.7	20.89	20.97	20.99	20.99	20.94	20.71	20.27	19.86	(87)

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

(88)m=	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.91	0.84	0.74	0.59	0.42	0.29	0.31	0.51	0.76	0.91	0.95	(89)

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

(90)m=	18.76	19.1	19.48	19.84	20.07	20.16	20.18	20.18	20.14	19.86	19.26	18.67	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.3	19.59	19.92	20.24	20.45	20.54	20.56	20.56	20.51	20.25	19.72	19.22	(92)

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

(93)m=	19.3	19.59	19.92	20.24	20.45	20.54	20.56	20.56	20.51	20.25	19.72	19.22	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.84	0.74	0.61	0.45	0.31	0.34	0.53	0.76	0.9	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	408.09	454.54	470.04	446.59	376.8	269.28	182.88	191.52	284.4	371.81	390.15	390.5	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	699.74	683.85	624.93	527.98	407.28	276.41	184.26	193.48	298.48	449.44	587.76	699.37	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	216.99	154.1	115.23	58.6	22.68	0	0	0	0	57.75	142.28	229.8	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	997.44	(98)
Space heating requirement in kWh/m²/year		18.76	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		997.44	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1047.31	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1855.53	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1948.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	29.96	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		40.05	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	40.05	(331)
Energy for lighting (calculated in Appendix L)		244.77	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	609.7	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.55	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	625.24	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			625.24	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	20.78	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	127.03	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			651.1	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.24	(384)
EI rating (section 14)				91.11	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:55

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 51.11m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 3 GF

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	29.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.06 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	43.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 3 GF

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.11 (1a)	x	2.55 (2a)	=	130.33	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.11 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	130.33	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x	1/[1/(1.2)+ 0.04]	=	10.18			(27)
Floor			51.11	x	0.12	=	6.1332	75	3833.25	(28)
Walls Type1	39.42	8.89	30.53	x	0.17	=	5.19	14	427.42	(29)
Walls Type2	7.37	2.1	5.27	x	0.21	=	1.1	30	158.1	(29)
Walls Type3	10.07	0	10.07	x	0.25	=	2.52	150	1510.5	(29)
Total area of elements, m²			107.97							(31)
Party wall			21.68	x	0	=	0	20	433.6	(32)
Party ceiling			51.11					30	1533.3	(32b)
Internal wall **			93.84					9	844.5599	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.27 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8740.73 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 171.02 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.73 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 35.01 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	21.59	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	56.59	56.51	56.51	56.51	56.51	56.51	56.51	56.51	56.51	56.51	56.51	56.51	

Average = Sum(39)$_{1...12}$ /12= 56.52 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	

Average = Sum(40)$_{1...12}$ /12= 1.11 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.72 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	82.63	79.62	76.62	73.61	70.61	67.61	67.61	70.61	73.61	76.62	79.62	82.63	

Total = Sum(44)$_{1...12}$ = 901.4 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	122.54	107.17	110.59	96.42	92.51	79.83	73.98	84.89	85.9	100.11	109.28	118.67	

Total = Sum(45)$_{1...12}$ = 1181.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.38	16.08	16.59	14.46	13.88	11.97	11.1	12.73	12.89	15.02	16.39	17.8	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	

Output from water heater (annual)$_{1...12}$ | 1832.72 | (64)

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

(65)m=	84.96	75.58	80.99	74.85	74.98	69.34	68.82	72.45	71.36	77.51	79.13	83.68	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	(66)

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

(67)m=	13.49	11.98	9.74	7.37	5.51	4.65	5.03	6.54	8.77	11.14	13	13.86	(67)

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

(68)m=	150.12	151.67	147.75	139.39	128.84	118.93	112.3	110.75	114.67	123.03	133.58	143.49	(68)

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

(69)m=	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	(71)

Water heating gains (Table 5)

(72)m=	114.2	112.46	108.86	103.96	100.78	96.3	92.5	97.37	99.11	104.18	109.9	112.47	(72)

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

(73)m=	326.64	324.96	315.19	299.57	283.98	268.73	258.67	263.5	271.4	287.19	305.33	318.67	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast	0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast	0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)
Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	413.69	473.23	518.06	550.93	565.53	548.24	528.15	510.46	491.06	451.06	409.58	393.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.93	0.87	0.76	0.61	0.46	0.49	0.69	0.88	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.66	19.87	20.16	20.49	20.77	20.93	20.98	20.98	20.88	20.53	20.03	19.6	(87)

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

(88)m=	19.99	20	20	20	20	20	20	20	20	20	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.92	0.84	0.71	0.53	0.36	0.39	0.62	0.85	0.95	0.98	(89)

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

(90)m=	18.23	18.54	18.95	19.41	19.76	19.94	19.99	19.98	19.89	19.47	18.76	18.15	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.88	19.15	19.5	19.9	20.22	20.39	20.44	20.44	20.34	19.95	19.34	18.81	(92)

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

(93)m=	18.88	19.15	19.5	19.9	20.22	20.39	20.44	20.44	20.34	19.95	19.34	18.81	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.91	0.84	0.73	0.56	0.4	0.44	0.65	0.85	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	398.83	446.15	469.63	462.49	410.7	307.77	212.88	222.35	318.2	384.39	385.67	381.13	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	825.34	804.99	734.83	621.72	481.5	327.34	217.05	228.08	352.8	528.54	691.72	825.8	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	317.33	241.14	197.31	114.64	52.68	0	0	0	0	107.25	220.36	330.83	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1581.53	(98)
Space heating requirement in kWh/m²/year	30.94	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1581.53	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1660.61	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1832.72	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1924.36	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.85	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		38.49	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	38.49	(331)
Energy for lighting (calculated in Appendix L)		238.17	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	729.65	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	18.61	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	748.25	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			748.25	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.97	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	123.61	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			769.87	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.06	(384)
EI rating (section 14)				89.27	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:41

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 51.11m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 3 TF

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	32.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.73 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 3 TF

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.11 (1a)	x	2.55 (2a)	=	130.33	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.11 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	130.33	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x	1/[1/(1.2)+ 0.04]	=	10.18			(27)
Walls Type1	39.42	8.89	30.53	x	0.17	=	5.19	14	427.42	(29)
Walls Type2	7.37	2.1	5.27	x	0.21	=	1.1	30	158.1	(29)
Walls Type3	10.07	0	10.07	x	0.25	=	2.52	150	1510.5	(29)
Roof	51.11	0	51.11	x	0.13	=	6.64	9	459.99	(30)
Total area of elements, m²			107.97							(31)
Party wall			21.68	x	0	=	0	20	433.6	(32)
Party floor			51.11					70	3577.7	(32a)
Internal wall **			93.84					9	844.5599	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7411.87 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 145.02 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.14 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.93 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	21.59	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	59.52	59.43	59.43	59.43	59.43	59.43	59.43	59.43	59.43	59.43	59.43	59.43	

Average = Sum(39)$_{1...12}$ /12= 59.44 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.16 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.72 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	82.63	79.62	76.62	73.61	70.61	67.61	67.61	70.61	73.61	76.62	79.62	82.63	

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

Total = Sum(44)$_{1...12}$ = 901.4 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	122.54	107.17	110.59	96.42	92.51	79.83	73.98	84.89	85.9	100.11	109.28	118.67	

Total = Sum(45)$_{1...12}$ = 1181.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.38	16.08	16.59	14.46	13.88	11.97	11.1	12.73	12.89	15.02	16.39	17.8	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	

Output from water heater (annual)$_{1...12}$ | 1832.72 | (64)

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

(65)m=	84.96	75.58	80.99	74.85	74.98	69.34	68.82	72.45	71.36	77.51	79.13	83.68	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	(66)

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

(67)m=	13.49	11.98	9.74	7.37	5.51	4.65	5.03	6.54	8.77	11.14	13	13.86	(67)

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

(68)m=	150.12	151.67	147.75	139.39	128.84	118.93	112.3	110.75	114.67	123.03	133.58	143.49	(68)

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

(69)m=	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	(71)

Water heating gains (Table 5)

(72)m=	114.2	112.46	108.86	103.96	100.78	96.3	92.5	97.37	99.11	104.18	109.9	112.47	(72)

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

(73)m=	326.64	324.96	315.19	299.57	283.98	268.73	258.67	263.5	271.4	287.19	305.33	318.67	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast	0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast	0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)
Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	413.69	473.23	518.06	550.93	565.53	548.24	528.15	510.46	491.06	451.06	409.58	393.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.92	0.86	0.76	0.61	0.47	0.5	0.69	0.87	0.95	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.37	19.61	19.94	20.32	20.66	20.88	20.96	20.95	20.81	20.38	19.8	19.31	(87)

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

(88)m=	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.94	0.9	0.83	0.71	0.54	0.37	0.4	0.62	0.84	0.94	0.97	(89)

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

(90)m=	17.81	18.14	18.61	19.15	19.59	19.85	19.93	19.92	19.78	19.24	18.42	17.72	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.52	18.81	19.22	19.69	20.08	20.32	20.4	20.39	20.25	19.76	19.05	18.44	(92)

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

(93)m=	18.52	18.81	19.22	19.69	20.08	20.32	20.4	20.39	20.25	19.76	19.05	18.44	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.93	0.89	0.82	0.72	0.56	0.41	0.44	0.64	0.83	0.92	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	392.9	438.13	459.98	453.08	405.52	309.55	217.92	226.83	316.7	376.37	378.66	375.89	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	846.39	826.75	755.92	641.03	498.12	340.01	225.91	237.28	365.59	544.55	710.32	846.56

(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	337.4	261.16	220.18	135.32	68.89	0	0	0	0	125.12	238.8	350.18

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1737.05 (98)

Space heating requirement in kWh/m²/year 33.99 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1737.05	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1823.91	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1832.72	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1924.36	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	37.48	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		38.49	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	38.49	(331)
Energy for lighting (calculated in Appendix L)		238.17	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	762.88	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.45	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	782.34	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			782.34	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.97	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	123.61	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			803.95	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.73	(384)
EI rating (section 14)				88.79	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:50:11

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 51.11m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 1 3

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	25.68 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.89 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 1 3

Address : P 1 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.11 (1a)	x	2.55 (2a)	=	130.33	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.11 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	130.33	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x1/[1/(1.2)+ 0.04]		=	10.18			(27)
Walls Type1	39.42	8.89	30.53	x	0.17	=	5.19	14	427.42	(29)
Walls Type2	7.37	2.1	5.27	x	0.21	=	1.1	30	158.1	(29)
Walls Type3	10.07	0	10.07	x	0.25	=	2.52	150	1510.5	(29)
Total area of elements, m²			56.86							(31)
Party wall			21.68	x	0	=	0	20	433.6	(32)
Party floor			51.11					70	3577.7	(32a)
Party ceiling			51.11					30	1533.3	(32b)
Internal wall **			93.84					9	844.5599	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.14 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8485.18 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 166.02 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.22 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.36 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	21.59	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.95	46.86	46.86	46.86	46.86	46.86	46.86	46.86	46.86	46.86	46.86	46.86	

Average = Sum(39)$_{1...12}$ /12= 46.87 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	

Average = Sum(40)$_{1...12}$ /12= 0.92 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.72 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	82.63	79.62	76.62	73.61	70.61	67.61	67.61	70.61	73.61	76.62	79.62	82.63	

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

Total = Sum(44)$_{1...12}$ = 901.4 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	122.54	107.17	110.59	96.42	92.51	79.83	73.98	84.89	85.9	100.11	109.28	118.67	

Total = Sum(45)$_{1...12}$ = 1181.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.38	16.08	16.59	14.46	13.88	11.97	11.1	12.73	12.89	15.02	16.39	17.8	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.81	157.1	165.87	149.91	147.79	133.33	129.25	140.16	139.4	155.39	162.77	173.95	

Output from water heater (annual)$_{1...12}$ | 1832.72 | (64)

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

(65)m=	84.96	75.58	80.99	74.85	74.98	69.34	68.82	72.45	71.36	77.51	79.13	83.68	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	86.14	(66)

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

(67)m=	13.49	11.98	9.74	7.37	5.51	4.65	5.03	6.54	8.77	11.14	13	13.86	(67)

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

(68)m=	150.12	151.67	147.75	139.39	128.84	118.93	112.3	110.75	114.67	123.03	133.58	143.49	(68)

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

(69)m=	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	-68.91	(71)

Water heating gains (Table 5)

(72)m=	114.2	112.46	108.86	103.96	100.78	96.3	92.5	97.37	99.11	104.18	109.9	112.47	(72)

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

(73)m=	326.64	324.96	315.19	299.57	283.98	268.73	258.67	263.5	271.4	287.19	305.33	318.67	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast	0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast	0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)
Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	413.69	473.23	518.06	550.93	565.53	548.24	528.15	510.46	491.06	451.06	409.58	393.16	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.9	0.82	0.7	0.53	0.39	0.42	0.62	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.98	20.19	20.44	20.7	20.89	20.97	20.99	20.99	20.95	20.72	20.3	19.93	(87)

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

(88)m=	20.15	20.15	20.15	20.15	20.15	20.15	20.15	20.15	20.15	20.15	20.15	20.15	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.94	0.89	0.79	0.65	0.46	0.31	0.34	0.55	0.81	0.93	0.97	(89)

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

(90)m=	18.81	19.1	19.45	19.81	20.04	20.13	20.15	20.15	20.11	19.83	19.26	18.73	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.34	19.59	19.9	20.21	20.42	20.52	20.54	20.53	20.49	20.24	19.74	19.28	(92)

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

(93)m=	19.34	19.59	19.9	20.21	20.42	20.52	20.54	20.53	20.49	20.24	19.74	19.28	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.88	0.8	0.66	0.49	0.35	0.38	0.58	0.81	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	395.92	439.82	457.07	439.24	375.38	269.99	183.18	191.93	284.87	367	380.11	378.94	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	706.32	688.61	628.14	530.21	408.88	277.22	184.42	193.71	299.48	451.56	592.15	706.49

(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	230.94	167.18	127.27	65.49	24.93	0	0	0	0	62.91	152.67	243.69

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1075.09 (98)

Space heating requirement in kWh/m²/year 21.03 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1075.09	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1128.85	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1832.72	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1924.36	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	30.53	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		38.49	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	38.49	(331)
Energy for lighting (calculated in Appendix L)		238.17	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	621.42	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	15.85	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	637.26	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			637.26	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.97	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	123.61	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			658.88	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.89	(384)
EI rating (section 14)				90.81	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:47

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.07m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 10 GF

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.62 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.14 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	43.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.99m²
Windows facing: South West	5.23m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 10 GF

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.07	(1a) x	2.55	(2a) =	193.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.07	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		193.98	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			5.23	x1/[1/(1.2)+ 0.04]		=	5.99			(27)
Floor			76.07	x	0.12	=	9.1284	75	5705.25	(28)
Walls Type1	42.51	16.22	26.29	x	0.17	=	4.47	14	368.06	(29)
Walls Type2	3.8	2.1	1.7	x	0.21	=	0.36	30	51	(29)
Walls Type3	14.25	0	14.25	x	0.2	=	2.91	150	2137.5	(29)
Total area of elements, m²			136.63							(31)
Party wall			41.06	x	0	=	0	20	821.2	(32)
Party ceiling			76.07					30	2282.1	(32b)
Internal wall **			139.66					9	1256.94	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12622.05 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 165.93 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.82 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 47.4 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	32.13	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	79.53	79.41	79.41	79.41	79.41	79.41	79.41	79.41	79.41	79.41	79.41	79.41	
											Average = Sum(39)$_{1...12}$ /12=	79.42	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	
											Average = Sum(40)$_{1...12}$ /12=	1.04	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.82 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	99.9	96.27	92.64	89.01	85.37	81.74	81.74	85.37	89.01	92.64	96.27	99.9	
											Total = Sum(44)$_{1...12}$ =	1089.86	(44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	148.15	129.58	133.71	116.57	111.85	96.52	89.44	102.64	103.86	121.04	132.13	143.48	
											Total = Sum(45)$_{1...12}$ =	1428.98	(45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.22	19.44	20.06	17.49	16.78	14.48	13.42	15.4	15.58	18.16	19.82	21.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	

Output from water heater (annual)$_{1...12}$ — 2079.82 — (64)

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

(65)m=	93.48	83.03	88.68	81.56	81.41	74.89	73.96	78.35	77.33	84.47	86.73	91.93	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	(66)

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

(67)m=	18.81	16.71	13.59	10.29	7.69	6.49	7.02	9.12	12.24	15.54	18.14	19.34	(67)

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

(68)m=	211.03	213.22	207.7	195.96	181.13	167.19	157.88	155.69	161.21	172.95	187.78	201.72	(68)

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

(69)m=	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	(71)

Water heating gains (Table 5)

(72)m=	125.65	123.55	119.19	113.27	109.43	104.01	99.41	105.31	107.4	113.53	120.45	123.56	(72)

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

(73)m=	414.26	412.24	399.25	378.28	357	336.45	323.06	328.87	339.61	360.79	385.14	403.38	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	5.23	x	36.79		0.48	x	0.8	=	51.21	(79)
Southwest	0.9x	0.77	x	5.23	x	62.67		0.48	x	0.8	=	87.23	(79)
Southwest	0.9x	0.77	x	5.23	x	85.75		0.48	x	0.8	=	119.35	(79)
Southwest	0.9x	0.77	x	5.23	x	106.25		0.48	x	0.8	=	147.88	(79)
Southwest	0.9x	0.77	x	5.23	x	119.01		0.48	x	0.8	=	165.63	(79)
Southwest	0.9x	0.77	x	5.23	x	118.15		0.48	x	0.8	=	164.44	(79)
Southwest	0.9x	0.77	x	5.23	x	113.91		0.48	x	0.8	=	158.53	(79)
Southwest	0.9x	0.77	x	5.23	x	104.39		0.48	x	0.8	=	145.29	(79)
Southwest	0.9x	0.77	x	5.23	x	92.85		0.48	x	0.8	=	129.23	(79)
Southwest	0.9x	0.77	x	5.23	x	69.27		0.48	x	0.8	=	96.4	(79)
Southwest	0.9x	0.77	x	5.23	x	44.07		0.48	x	0.8	=	61.34	(79)
Southwest	0.9x	0.77	x	5.23	x	31.49		0.48	x	0.8	=	43.82	(79)
Northwest	0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(81)
Northwest	0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(81)
Northwest	0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(81)
Northwest	0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(81)
Northwest	0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(81)
Northwest	0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(81)
Northwest	0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(81)
Northwest	0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(81)
Northwest	0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(81)
Northwest	0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(81)
Northwest	0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(81)
Northwest	0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	84.21	154.39	240.36	346.62	432.78	449.24	424.97	357.69	276.69	178.49	102.86	70.77

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	498.46	566.64	639.61	724.89	789.79	785.7	748.03	686.56	616.29	539.28	487.99	474.15

(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.99	0.98	0.95	0.89	0.77	0.6	0.45	0.51	0.75	0.93	0.98	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.56	19.75	20.06	20.46	20.77	20.94	20.98	20.97	20.85	20.44	19.92	19.51

(87)

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

(88)m=	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.94	0.87	0.72	0.53	0.36	0.41	0.68	0.9	0.97	0.99

(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	18.12	18.4	18.85	19.4	19.81	20	20.04	20.03	19.91	19.38	18.65	18.05	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.66	18.91	19.31	19.8	20.18	20.35	20.4	20.39	20.27	19.78	19.13	18.6	(92)

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

(93)m=	18.66	18.91	19.31	19.8	20.18	20.35	20.4	20.39	20.27	19.78	19.13	18.6	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.96	0.93	0.86	0.73	0.55	0.4	0.45	0.7	0.9	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	487.56	546.47	597.24	624.64	576.21	432.61	296.35	308.46	429.9	484.11	470.46	465.41	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1142.25	1112.32	1017.23	865.55	673.13	456.79	301.4	316.71	489.73	729.07	954.94	1143.31	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	487.09	380.25	312.48	173.46	72.11	0	0	0	0	182.25	348.83	504.36	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2460.82 (98)

Space heating requirement in kWh/m²/year 32.35 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		2460.82	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2583.86	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2079.82

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2183.81 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 47.68 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		57.28	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	57.28	(331)
Energy for lighting (calculated in Appendix L)		332.25	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	970.36	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	24.74	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	995.11	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				995.11	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	29.73	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	172.44	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1075.31	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.14	(384)
EI rating (section 14)					88.1	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:33

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.07m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 10 TF

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	29.2 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.55 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.23 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.99m²
Windows facing: South West	5.23m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 10 TF

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.07	(1a) x	2.55	(2a) =	193.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.07	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		193.98	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			5.23	x1/[1/(1.2)+ 0.04]		=	5.99			(27)
Walls Type1	42.51	16.22	26.29	x	0.17	=	4.47	14	368.06	(29)
Walls Type2	3.8	2.1	1.7	x	0.21	=	0.36	30	51	(29)
Walls Type3	14.25	0	14.25	x	0.2	=	2.91	150	2137.5	(29)
Roof	76.07	0	76.07	x	0.13	=	9.89	9	684.63	(30)
Total area of elements, m²			136.63							(31)
Party wall			41.06	x	0	=	0	20	821.2	(32)
Party floor			76.07					70	5324.9	(32a)
Internal wall **			139.66					9	1256.94	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 39.34 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10644.23 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 139.93 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.14 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 50.49 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	32.13	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	82.62	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	

Average = Sum(39)$_{1...12}$ /12= 82.51 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.08 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.82 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	99.9	96.27	92.64	89.01	85.37	81.74	81.74	85.37	89.01	92.64	96.27	99.9	

Total = Sum(44)$_{1...12}$ = 1089.86 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	148.15	129.58	133.71	116.57	111.85	96.52	89.44	102.64	103.86	121.04	132.13	143.48	

Total = Sum(45)$_{1...12}$ = 1428.98 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.22	19.44	20.06	17.49	16.78	14.48	13.42	15.4	15.58	18.16	19.82	21.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	

Output from water heater (annual)$_{1...12}$ — 2079.82 — (64)

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

(65)m=	93.48	83.03	88.68	81.56	81.41	74.89	73.96	78.35	77.33	84.47	86.73	91.93	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	(66)

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

(67)m=	18.81	16.71	13.59	10.29	7.69	6.49	7.02	9.12	12.24	15.54	18.14	19.34	(67)

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

(68)m=	211.03	213.22	207.7	195.96	181.13	167.19	157.88	155.69	161.21	172.95	187.78	201.72	(68)

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

(69)m=	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	(71)

Water heating gains (Table 5)

(72)m=	125.65	123.55	119.19	113.27	109.43	104.01	99.41	105.31	107.4	113.53	120.45	123.56	(72)

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

(73)m=	414.26	412.24	399.25	378.28	357	336.45	323.06	328.87	339.61	360.79	385.14	403.38	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	5.23	x	36.79		0.48	x	0.8	=	51.21	(79)
Southwest	0.9x	0.77	x	5.23	x	62.67		0.48	x	0.8	=	87.23	(79)
Southwest	0.9x	0.77	x	5.23	x	85.75		0.48	x	0.8	=	119.35	(79)
Southwest	0.9x	0.77	x	5.23	x	106.25		0.48	x	0.8	=	147.88	(79)
Southwest	0.9x	0.77	x	5.23	x	119.01		0.48	x	0.8	=	165.63	(79)
Southwest	0.9x	0.77	x	5.23	x	118.15		0.48	x	0.8	=	164.44	(79)
Southwest	0.9x	0.77	x	5.23	x	113.91		0.48	x	0.8	=	158.53	(79)
Southwest	0.9x	0.77	x	5.23	x	104.39		0.48	x	0.8	=	145.29	(79)
Southwest	0.9x	0.77	x	5.23	x	92.85		0.48	x	0.8	=	129.23	(79)
Southwest	0.9x	0.77	x	5.23	x	69.27		0.48	x	0.8	=	96.4	(79)
Southwest	0.9x	0.77	x	5.23	x	44.07		0.48	x	0.8	=	61.34	(79)
Southwest	0.9x	0.77	x	5.23	x	31.49		0.48	x	0.8	=	43.82	(79)
Northwest	0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(81)
Northwest	0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(81)
Northwest	0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(81)
Northwest	0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(81)
Northwest	0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(81)
Northwest	0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(81)
Northwest	0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(81)
Northwest	0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(81)
Northwest	0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(81)
Northwest	0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(81)
Northwest	0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(81)
Northwest	0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	84.21	154.39	240.36	346.62	432.78	449.24	424.97	357.69	276.69	178.49	102.86	70.77

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	498.46	566.64	639.61	724.89	789.79	785.7	748.03	686.56	616.29	539.28	487.99	474.15

(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.98	0.97	0.94	0.88	0.76	0.6	0.46	0.52	0.74	0.91	0.97	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.28	19.5	19.85	20.3	20.68	20.89	20.97	20.95	20.78	20.29	19.7	19.23

(87)

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

(88)m=	20.01	20.01	20.01	20.01	20.01	20.01	20.01	20.01	20.01	20.01	20.01	20.01

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.93	0.85	0.71	0.53	0.37	0.42	0.68	0.89	0.96	0.98

(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	17.72	18.03	18.54	19.17	19.67	19.93	20	19.98	19.81	19.17	18.33	17.64	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.31	18.58	19.04	19.6	20.05	20.29	20.36	20.35	20.18	19.6	18.85	18.24	(92)

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

(93)m=	18.31	18.58	19.04	19.6	20.05	20.29	20.36	20.35	20.18	19.6	18.85	18.24	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.95	0.91	0.84	0.72	0.55	0.4	0.45	0.69	0.88	0.95	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	481.67	537.95	585.13	609.99	566.2	432.71	300.99	311.65	423.42	473.02	463.08	460.3	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1157.47	1128.81	1034.29	882.52	689.01	469.56	310.4	325.88	501.4	742.18	968.96	1158.11	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	502.8	397.06	334.18	196.22	91.36	0	0	0	0	200.25	364.24	519.17	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2605.28 (98)

Space heating requirement in kWh/m²/year 34.25 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		2605.28	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2735.54	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2079.82

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2183.81 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 49.19 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		57.28	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	57.28	(331)
Energy for lighting (calculated in Appendix L)		332.25	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1001.23	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.53	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	1026.76	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				1026.76	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	29.73	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	172.44	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1106.97	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.55	(384)
EI rating (section 14)					87.75	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:50:02

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.07m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 10

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.14 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.99 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.99m²
Windows facing: South West	5.23m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 10

Address : P 2 10, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.07	(1a) x	2.55	(2a) =	193.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.07	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		193.98	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			5.23	x1/[1/(1.2)+ 0.04]		=	5.99			(27)
Walls Type1	42.51	16.22	26.29	x	0.17	=	4.47	14	368.06	(29)
Walls Type2	3.8	2.1	1.7	x	0.21	=	0.36	30	51	(29)
Walls Type3	14.25	0	14.25	x	0.2	=	2.91	150	2137.5	(29)
Total area of elements, m²			60.56							(31)
Party wall			41.06	x	0	=	0	20	821.2	(32)
Party floor			76.07					70	5324.9	(32a)
Party ceiling			76.07					30	2282.1	(32b)
Internal wall **			139.66					9	1256.94	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.46 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12241.7 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 160.93 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.93 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 33.39 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	32.13	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	65.52	65.39	65.39	65.39	65.39	65.39	65.39	65.39	65.39	65.39	65.39	65.39	

Average = Sum(39)$_{1...12}$ /12= 65.4 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.82 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	99.9	96.27	92.64	89.01	85.37	81.74	81.74	85.37	89.01	92.64	96.27	99.9	

Total = Sum(44)$_{1...12}$ = 1089.86 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	148.15	129.58	133.71	116.57	111.85	96.52	89.44	102.64	103.86	121.04	132.13	143.48	

Total = Sum(45)$_{1...12}$ = 1428.98 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.22	19.44	20.06	17.49	16.78	14.48	13.42	15.4	15.58	18.16	19.82	21.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	203.43	179.5	188.99	170.07	167.13	150.02	144.72	157.91	157.36	176.32	185.62	198.76	

Output from water heater (annual)$_{1...12}$ — 2079.82 — (64)

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

(65)m=	93.48	83.03	88.68	81.56	81.41	74.89	73.96	78.35	77.33	84.47	86.73	91.93	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	119.2	(66)

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

(67)m=	18.81	16.71	13.59	10.29	7.69	6.49	7.02	9.12	12.24	15.54	18.14	19.34	(67)

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

(68)m=	211.03	213.22	207.7	195.96	181.13	167.19	157.88	155.69	161.21	172.95	187.78	201.72	(68)

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

(69)m=	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	34.92	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	-95.36	(71)

Water heating gains (Table 5)

(72)m=	125.65	123.55	119.19	113.27	109.43	104.01	99.41	105.31	107.4	113.53	120.45	123.56	(72)

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

(73)m=	414.26	412.24	399.25	378.28	357	336.45	323.06	328.87	339.61	360.79	385.14	403.38	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	5.23	x	36.79		0.48	x	0.8	=	51.21	(79)
Southwest	0.9x	0.77	x	5.23	x	62.67		0.48	x	0.8	=	87.23	(79)
Southwest	0.9x	0.77	x	5.23	x	85.75		0.48	x	0.8	=	119.35	(79)
Southwest	0.9x	0.77	x	5.23	x	106.25		0.48	x	0.8	=	147.88	(79)
Southwest	0.9x	0.77	x	5.23	x	119.01		0.48	x	0.8	=	165.63	(79)
Southwest	0.9x	0.77	x	5.23	x	118.15		0.48	x	0.8	=	164.44	(79)
Southwest	0.9x	0.77	x	5.23	x	113.91		0.48	x	0.8	=	158.53	(79)
Southwest	0.9x	0.77	x	5.23	x	104.39		0.48	x	0.8	=	145.29	(79)
Southwest	0.9x	0.77	x	5.23	x	92.85		0.48	x	0.8	=	129.23	(79)
Southwest	0.9x	0.77	x	5.23	x	69.27		0.48	x	0.8	=	96.4	(79)
Southwest	0.9x	0.77	x	5.23	x	44.07		0.48	x	0.8	=	61.34	(79)
Southwest	0.9x	0.77	x	5.23	x	31.49		0.48	x	0.8	=	43.82	(79)
Northwest	0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(81)
Northwest	0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(81)
Northwest	0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(81)
Northwest	0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(81)
Northwest	0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(81)
Northwest	0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(81)
Northwest	0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(81)
Northwest	0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(81)
Northwest	0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(81)
Northwest	0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(81)
Northwest	0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(81)
Northwest	0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	84.21	154.39	240.36	346.62	432.78	449.24	424.97	357.69	276.69	178.49	102.86	70.77	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	498.46	566.64	639.61	724.89	789.79	785.7	748.03	686.56	616.29	539.28	487.99	474.15	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.85	0.7	0.52	0.38	0.43	0.67	0.9	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.88	20.07	20.35	20.68	20.89	20.98	21	20.99	20.93	20.64	20.19	19.83	(87)

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

(88)m=	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.92	0.82	0.65	0.46	0.31	0.36	0.61	0.87	0.96	0.98	(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	18.7	18.97	19.37	19.82	20.09	20.18	20.2	20.2	20.14	19.78	19.15	18.63	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.14	19.38	19.74	20.14	20.4	20.48	20.5	20.5	20.44	20.1	19.54	19.08	(92)

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

(93)m=	19.14	19.38	19.74	20.14	20.4	20.48	20.5	20.5	20.44	20.1	19.54	19.08	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.96	0.92	0.82	0.66	0.48	0.34	0.39	0.63	0.87	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	485.81	542.21	586.24	596.44	524.61	376.5	253.66	265.49	388.52	469.07	466.8	464.15	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	972.6	947.07	866.04	735.19	568.61	384.76	255.04	267.95	414.6	621.29	813.79	973.1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	362.18	272.06	208.17	99.9	32.74	0	0	0	0	113.25	249.83	378.66	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1716.78 (98)

Space heating requirement in kWh/m²/year 22.57 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1716.78	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1802.62	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2079.82

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2183.81 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 39.86 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		57.28	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	57.28	(331)
Energy for lighting (calculated in Appendix L)		332.25	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	811.36	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.69	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	832.05	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				832.05	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	29.73	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	172.44	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				912.25	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.99	(384)
EI rating (section 14)					89.9	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:38

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.19m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 11 GF

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	28.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.84 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	43.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.64m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 11 GF

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.19 (1a)	x	2.55 (2a)	=	158.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.19 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	158.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Floor			62.19	x	0.12	=	7.4628	75	4664.25	(28)
Walls Type1	25.12	10.64	14.48	x	0.17	=	2.46	14	202.72	(29)
Walls Type2	26.85	2.1	24.75	x	0.21	=	5.18	30	742.5	(29)
Total area of elements, m²			114.16							(31)
Party wall			32.08	x	0	=	0	20	641.6	(32)
Party ceiling			62.19					30	1865.7	(32b)
Internal wall **			114.18					9	1027.62	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 30.44 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9144.39 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 147.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.87 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.31 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.27	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	63.58	63.48	63.48	63.48	63.48	63.48	63.48	63.48	63.48	63.48	63.48	63.48	

Average = Sum(39)$_{1...12}$ /12= 63.48 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02

Average = Sum(40)$_{1...12}$ /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.04 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.72 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	90.99	87.68	84.37	81.06	77.75	74.45	74.45	77.75	81.06	84.37	87.68	90.99

Total = Sum(44)$_{1...12}$ = 992.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	134.93	118.01	121.78	106.17	101.87	87.91	81.46	93.48	94.59	110.24	120.34	130.68

Total = Sum(45)$_{1...12}$ = 1301.46 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.24	17.7	18.27	15.93	15.28	13.19	12.22	14.02	14.19	16.54	18.05	19.6

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	

Output from water heater (annual)$_{1...12}$ 1952.3 (64)

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

(65)m=	89.09	79.18	84.71	78.1	78.09	72.02	71.31	75.3	74.25	80.88	82.81	87.67	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	(66)

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

(67)m=	16.06	14.26	11.6	8.78	6.56	5.54	5.99	7.78	10.45	13.27	15.48	16.51	(67)

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

(68)m=	178.43	180.29	175.62	165.69	153.15	141.36	133.49	131.64	136.3	146.24	158.78	170.56	(68)

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

(69)m=	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	(71)

Water heating gains (Table 5)

(72)m=	119.74	117.83	113.86	108.47	104.97	100.03	95.84	101.21	103.12	108.7	115.01	117.84	(72)

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

(73)m=	367.88	366.02	354.72	336.58	318.32	300.58	288.96	294.28	303.52	321.85	342.91	358.55	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northwest 0.9x	0.77	x	10.64	x	11.28	x	0.48	x	0.8	=	31.95	(81)
Northwest 0.9x	0.77	x	10.64	x	22.97	x	0.48	x	0.8	=	65.03	(81)
Northwest 0.9x	0.77	x	10.64	x	41.38	x	0.48	x	0.8	=	117.16	(81)
Northwest 0.9x	0.77	x	10.64	x	67.96	x	0.48	x	0.8	=	192.41	(81)
Northwest 0.9x	0.77	x	10.64	x	91.35	x	0.48	x	0.8	=	258.64	(81)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	10.64	x	97.38	x	0.48	x	0.8	=	275.74	(81)
Northwest	0.9x	0.77	x	10.64	x	91.1	x	0.48	x	0.8	=	257.95	(81)
Northwest	0.9x	0.77	x	10.64	x	72.63	x	0.48	x	0.8	=	205.64	(81)
Northwest	0.9x	0.77	x	10.64	x	50.42	x	0.48	x	0.8	=	142.76	(81)
Northwest	0.9x	0.77	x	10.64	x	28.07	x	0.48	x	0.8	=	79.47	(81)
Northwest	0.9x	0.77	x	10.64	x	14.2	x	0.48	x	0.8	=	40.2	(81)
Northwest	0.9x	0.77	x	10.64	x	9.21	x	0.48	x	0.8	=	26.09	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	31.95	65.03	117.16	192.41	258.64	275.74	257.95	205.64	142.76	79.47	40.2	26.09	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	399.82	431.05	471.89	528.99	576.96	576.32	546.91	499.92	446.28	401.32	383.11	384.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.98	0.96	0.9	0.79	0.63	0.49	0.55	0.78	0.93	0.97	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.45	19.6	19.91	20.33	20.69	20.9	20.97	20.96	20.79	20.33	19.82	19.4	(87)

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

(88)m=	20.06	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.95	0.88	0.75	0.56	0.39	0.45	0.72	0.91	0.97	0.98	(89)

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

(90)m=	17.99	18.22	18.66	19.25	19.74	19.99	20.05	20.04	19.87	19.27	18.53	17.93	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.54	18.74	19.13	19.66	20.1	20.33	20.4	20.39	20.22	19.67	19.02	18.49	(92)

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

(93)m=	18.54	18.74	19.13	19.66	20.1	20.33	20.4	20.39	20.22	19.67	19.02	18.49	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.97	0.96	0.94	0.87	0.75	0.58	0.43	0.48	0.73	0.9	0.96	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	388.4	414.34	441.57	461.86	434.87	335.83	234.35	242.39	324.91	361.61	366.84	374.93	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	905.57	878.68	801.94	682.76	533.17	363.98	241.2	253.14	388.28	575.83	756.46	906.91	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	384.78	312.04	268.12	159.04	73.13	0	0	0	0	159.38	280.53	395.8	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2032.82	(98)
Space heating requirement in kWh/m²/year		32.69	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2032.82	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2134.46	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1952.3	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2049.92	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	41.84	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		46.83	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	46.83	(331)
Energy for lighting (calculated in Appendix L)		283.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	851.64	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.72	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	873.36	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			873.36	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	24.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	147.2	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			922.9	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.84	(384)
EI rating (section 14)				88.46	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:24

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.19m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 11 TF

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	31.11 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.31 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 11 TF

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.19 (1a)	x	2.55 (2a)	=	158.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.19 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	158.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	25.12	10.64	14.48	x	0.17	=	2.46	14	202.72	(29)
Walls Type2	26.85	2.1	24.75	x	0.21	=	5.18	30	742.5	(29)
Roof	62.19	0	62.19	x	0.13	=	8.08	9	559.71	(30)
Total area of elements, m²			114.16							(31)
Party wall			32.08	x	0	=	0	20	641.6	(32)
Party floor			62.19					70	4353.3	(32a)
Internal wall **			114.18					9	1027.62	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 31.06 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7527.45 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 121.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.3 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.36 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.27	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	66.63	66.53	66.53	66.53	66.53	66.53	66.53	66.53	66.53	66.53	66.53	66.53	

Average = Sum(39)$_{1...12}$ /12= 66.53 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07

Average = Sum(40)$_{1...12}$ /12= 1.07 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.04 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.72 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	90.99	87.68	84.37	81.06	77.75	74.45	74.45	77.75	81.06	84.37	87.68	90.99

Total = Sum(44)$_{1...12}$ = 992.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	134.93	118.01	121.78	106.17	101.87	87.91	81.46	93.48	94.59	110.24	120.34	130.68

Total = Sum(45)$_{1...12}$ = 1301.46 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.24	17.7	18.27	15.93	15.28	13.19	12.22	14.02	14.19	16.54	18.05	19.6

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	

Output from water heater (annual)$_{1...12}$ 1952.3 (64)

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

(65)m=	89.09	79.18	84.71	78.1	78.09	72.02	71.31	75.3	74.25	80.88	82.81	87.67	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	(66)

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

(67)m=	16.06	14.26	11.6	8.78	6.56	5.54	5.99	7.78	10.45	13.27	15.48	16.51	(67)

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

(68)m=	178.43	180.29	175.62	165.69	153.15	141.36	133.49	131.64	136.3	146.24	158.78	170.56	(68)

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

(69)m=	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	(71)

Water heating gains (Table 5)

(72)m=	119.74	117.83	113.86	108.47	104.97	100.03	95.84	101.21	103.12	108.7	115.01	117.84	(72)

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

(73)m=	367.88	366.02	354.72	336.58	318.32	300.58	288.96	294.28	303.52	321.85	342.91	358.55	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northwest 0.9x	0.77	x	10.64	x	11.28	x	0.48	x	0.8	=	31.95	(81)
Northwest 0.9x	0.77	x	10.64	x	22.97	x	0.48	x	0.8	=	65.03	(81)
Northwest 0.9x	0.77	x	10.64	x	41.38	x	0.48	x	0.8	=	117.16	(81)
Northwest 0.9x	0.77	x	10.64	x	67.96	x	0.48	x	0.8	=	192.41	(81)
Northwest 0.9x	0.77	x	10.64	x	91.35	x	0.48	x	0.8	=	258.64	(81)

DER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	10.64	x	97.38	x	0.48	x	0.8	=	275.74	(81)
Northwest 0.9x	0.77	x	10.64	x	91.1	x	0.48	x	0.8	=	257.95	(81)
Northwest 0.9x	0.77	x	10.64	x	72.63	x	0.48	x	0.8	=	205.64	(81)
Northwest 0.9x	0.77	x	10.64	x	50.42	x	0.48	x	0.8	=	142.76	(81)
Northwest 0.9x	0.77	x	10.64	x	28.07	x	0.48	x	0.8	=	79.47	(81)
Northwest 0.9x	0.77	x	10.64	x	14.2	x	0.48	x	0.8	=	40.2	(81)
Northwest 0.9x	0.77	x	10.64	x	9.21	x	0.48	x	0.8	=	26.09	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	31.95	65.03	117.16	192.41	258.64	275.74	257.95	205.64	142.76	79.47	40.2	26.09	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	399.82	431.05	471.89	528.99	576.96	576.32	546.91	499.92	446.28	401.32	383.11	384.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.94	0.89	0.78	0.63	0.5	0.55	0.77	0.91	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.11	19.29	19.64	20.12	20.56	20.84	20.94	20.92	20.69	20.15	19.54	19.06	(87)

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

(88)m=	20.02	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.96	0.93	0.87	0.74	0.56	0.4	0.45	0.71	0.89	0.95	0.97	(89)

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

(90)m=	17.5	17.75	18.26	18.94	19.54	19.88	19.99	19.97	19.72	19	18.13	17.42	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.11	18.33	18.78	19.39	19.93	20.25	20.35	20.33	20.09	19.43	18.67	18.04	(92)

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

(93)m=	18.11	18.33	18.78	19.39	19.93	20.25	20.35	20.33	20.09	19.43	18.67	18.04	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.91	0.85	0.74	0.58	0.43	0.49	0.71	0.88	0.94	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	382.05	406.45	431.16	448.96	424.39	333.57	237.17	243.56	317.59	351.86	359.54	369.19	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	919.99	893.72	817.22	697.88	547.35	375.62	249.65	261.64	398.65	587.64	769.52	921.05	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	400.22	327.44	287.23	179.22	91.48	0	0	0	0	175.42	295.18	410.58	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2166.77	(98)
Space heating requirement in kWh/m²/year		34.84	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2166.77	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2275.11	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1952.3	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2049.92	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	43.25	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		46.83	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	46.83	(331)
Energy for lighting (calculated in Appendix L)		283.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	880.27	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.45	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	902.72	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			902.72	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	24.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	147.2	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			952.26	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.31	(384)
EI rating (section 14)				88.1	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:53

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.19m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 11

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.9 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.79 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 11

Address : P 2 11, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.19 (1a)	x	2.55 (2a)	=	158.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.19 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	158.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	25.12	10.64	14.48	x	0.17	=	2.46	14	202.72	(29)
Walls Type2	26.85	2.1	24.75	x	0.21	=	5.18	30	742.5	(29)
Total area of elements, m²			51.97							(31)
Party wall			32.08	x	0	=	0	20	641.6	(32)
Party floor			62.19					70	4353.3	(32a)
Party ceiling			62.19					30	1865.7	(32b)
Internal wall **			114.18					9	1027.62	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.97 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8833.44 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 142.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.37 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 26.34 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.27	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	26.17	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	52.61	52.51	52.51	52.51	52.51	52.51	52.51	52.51	52.51	52.51	52.51	52.51	

Average = Sum(39)$_{1...12}$ /12= 52.52 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.85	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84

Average = Sum(40)$_{1...12}$ /12= 0.84 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.04 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.72 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	90.99	87.68	84.37	81.06	77.75	74.45	74.45	77.75	81.06	84.37	87.68	90.99

Total = Sum(44)$_{1...12}$ = 992.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	134.93	118.01	121.78	106.17	101.87	87.91	81.46	93.48	94.59	110.24	120.34	130.68

Total = Sum(45)$_{1...12}$ = 1301.46 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.24	17.7	18.27	15.93	15.28	13.19	12.22	14.02	14.19	16.54	18.05	19.6

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	190.21	167.94	177.06	159.66	157.15	141.4	136.74	148.75	148.09	165.52	173.83	185.95	

Output from water heater (annual)$_{1...12}$ 1952.3 (64)

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

(65)m=	89.09	79.18	84.71	78.1	78.09	72.02	71.31	75.3	74.25	80.88	82.81	87.67	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	102.14	(66)

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

(67)m=	16.06	14.26	11.6	8.78	6.56	5.54	5.99	7.78	10.45	13.27	15.48	16.51	(67)

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

(68)m=	178.43	180.29	175.62	165.69	153.15	141.36	133.49	131.64	136.3	146.24	158.78	170.56	(68)

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

(69)m=	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	33.21	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	-81.71	(71)

Water heating gains (Table 5)

(72)m=	119.74	117.83	113.86	108.47	104.97	100.03	95.84	101.21	103.12	108.7	115.01	117.84	(72)

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

(73)m=	367.88	366.02	354.72	336.58	318.32	300.58	288.96	294.28	303.52	321.85	342.91	358.55	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northwest 0.9x	0.77	x	10.64	x	11.28	x	0.48	x	0.8	=	31.95	(81)
Northwest 0.9x	0.77	x	10.64	x	22.97	x	0.48	x	0.8	=	65.03	(81)
Northwest 0.9x	0.77	x	10.64	x	41.38	x	0.48	x	0.8	=	117.16	(81)
Northwest 0.9x	0.77	x	10.64	x	67.96	x	0.48	x	0.8	=	192.41	(81)
Northwest 0.9x	0.77	x	10.64	x	91.35	x	0.48	x	0.8	=	258.64	(81)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	10.64	x	97.38	x	0.48	x	0.8	=	275.74	(81)
Northwest	0.9x	0.77	x	10.64	x	91.1	x	0.48	x	0.8	=	257.95	(81)
Northwest	0.9x	0.77	x	10.64	x	72.63	x	0.48	x	0.8	=	205.64	(81)
Northwest	0.9x	0.77	x	10.64	x	50.42	x	0.48	x	0.8	=	142.76	(81)
Northwest	0.9x	0.77	x	10.64	x	28.07	x	0.48	x	0.8	=	79.47	(81)
Northwest	0.9x	0.77	x	10.64	x	14.2	x	0.48	x	0.8	=	40.2	(81)
Northwest	0.9x	0.77	x	10.64	x	9.21	x	0.48	x	0.8	=	26.09	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	31.95	65.03	117.16	192.41	258.64	275.74	257.95	205.64	142.76	79.47	40.2	26.09	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	399.82	431.05	471.89	528.99	576.96	576.32	546.91	499.92	446.28	401.32	383.11	384.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.87	0.73	0.55	0.42	0.47	0.71	0.91	0.97	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.78	19.93	20.21	20.56	20.84	20.96	20.99	20.98	20.89	20.54	20.1	19.74	(87)

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

(88)m=	20.21	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.96	0.93	0.85	0.69	0.5	0.34	0.4	0.66	0.88	0.96	0.98	(89)

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

(90)m=	18.57	18.79	19.19	19.68	20.04	20.18	20.21	20.2	20.11	19.67	19.04	18.51	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.03	19.22	19.57	20.02	20.34	20.48	20.51	20.5	20.41	20	19.44	18.98	(92)

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

(93)m=	19.03	19.22	19.57	20.02	20.34	20.48	20.51	20.5	20.41	20	19.44	18.98	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.97	0.95	0.92	0.84	0.7	0.52	0.37	0.42	0.67	0.88	0.95	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	386.62	411.27	434.9	445.38	402.74	297.11	202.8	211.43	299.16	352.28	363.78	373.52	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	774.98	751.93	686.45	583.66	453.69	308.54	205.08	215.31	331.12	493.49	647.88	775.82	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	288.94	228.92	187.15	99.57	37.9	0	0	0	0	105.06	204.56	299.31	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1451.41	(98)
Space heating requirement in kWh/m²/year		23.34	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1451.41	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1523.98	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1952.3	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2049.92	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.74	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		46.83	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	46.83	(331)
Energy for lighting (calculated in Appendix L)		283.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	727.39	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.55	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	745.94	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			745.94	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	24.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	147.2	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			795.48	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.79	(384)
EI rating (section 14)				90.06	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:30

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64.15m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 12 GF

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.94 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.32 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	36.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.64m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 12 GF

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64.15 (1a)	x	2.55 (2a)	=	163.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64.15 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	163.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Floor			64.15	x	0.12	=	7.698	75	4811.25	(28)
Walls Type1	21.27	10.64	10.63	x	0.17	=	1.81	14	148.82	(29)
Walls Type2	21.22	2.1	19.12	x	0.21	=	4	30	573.6	(29)
Total area of elements, m²			106.64							(31)
Party wall			39.3	x	0	=	0	20	786	(32)
Party ceiling			64.15					30	1924.5	(32b)
Internal wall **			117.78					9	1060.02	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.84 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9304.19 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 145.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.97 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 35.81 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	27.1	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	62.91	62.8	62.8	62.8	62.8	62.8	62.8	62.8	62.8	62.8	62.8	62.8	

Average = Sum(39)$_{1...12}$ /12= 62.81 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98

Average = Sum(40)$_{1...12}$ /12= 0.98 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.1 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.99 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	92.38	89.02	85.66	82.31	78.95	75.59	75.59	78.95	82.31	85.66	89.02	92.38

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

Total = Sum(44)$_{1...12}$ = 1007.82 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	137	119.82	123.65	107.8	103.43	89.26	82.71	94.91	96.04	111.93	122.18	132.68

Total = Sum(45)$_{1...12}$ = 1321.41 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.55	17.97	18.55	16.17	15.52	13.39	12.41	14.24	14.41	16.79	18.33	19.9

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	

Output from water heater (annual)$_{1...12}$ 1972.25 (64)

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

(65)m=	89.77	79.78	85.33	78.64	78.61	72.47	71.72	75.78	74.73	81.44	83.42	88.34	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	(66)

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

(67)m=	16.56	14.71	11.96	9.06	6.77	5.72	6.18	8.03	10.77	13.68	15.97	17.02	(67)

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

(68)m=	183.28	185.18	180.39	170.19	157.31	145.2	137.11	135.21	140.01	150.21	163.09	175.19	(68)

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

(69)m=	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	(71)

Water heating gains (Table 5)

(72)m=	120.66	118.72	114.7	109.22	105.66	100.66	96.4	101.85	103.79	109.46	115.86	118.73	(72)

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

(73)m=	374.95	373.06	361.49	342.9	324.18	306.02	294.13	299.54	309.01	327.79	349.36	365.39	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.64	x	36.79	x	0.48	x	0.8	=	104.18	(77)
Southeast 0.9x	0.77	x	10.64	x	62.67	x	0.48	x	0.8	=	177.46	(77)
Southeast 0.9x	0.77	x	10.64	x	85.75	x	0.48	x	0.8	=	242.8	(77)
Southeast 0.9x	0.77	x	10.64	x	106.25	x	0.48	x	0.8	=	300.84	(77)
Southeast 0.9x	0.77	x	10.64	x	119.01	x	0.48	x	0.8	=	336.97	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	10.64	x	118.15	x	0.48	x	0.8	=	334.53	(77)
Southeast	0.9x	0.77	x	10.64	x	113.91	x	0.48	x	0.8	=	322.53	(77)
Southeast	0.9x	0.77	x	10.64	x	104.39	x	0.48	x	0.8	=	295.57	(77)
Southeast	0.9x	0.77	x	10.64	x	92.85	x	0.48	x	0.8	=	262.9	(77)
Southeast	0.9x	0.77	x	10.64	x	69.27	x	0.48	x	0.8	=	196.13	(77)
Southeast	0.9x	0.77	x	10.64	x	44.07	x	0.48	x	0.8	=	124.78	(77)
Southeast	0.9x	0.77	x	10.64	x	31.49	x	0.48	x	0.8	=	89.16	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	479.13	550.51	604.29	643.75	661.15	640.55	616.66	595.11	571.92	523.92	474.14	454.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.92	0.85	0.74	0.58	0.44	0.47	0.67	0.87	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.65	19.88	20.18	20.51	20.78	20.93	20.98	20.98	20.88	20.54	20.03	19.59	(87)

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

(88)m=	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.9	0.82	0.69	0.51	0.35	0.38	0.6	0.84	0.94	0.97	(89)

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

(90)m=	18.31	18.63	19.06	19.52	19.87	20.04	20.09	20.09	20	19.57	18.85	18.22	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.82	19.1	19.48	19.89	20.21	20.38	20.43	20.42	20.33	19.94	19.3	18.74	(92)

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

(93)m=	18.82	19.1	19.48	19.89	20.21	20.38	20.43	20.42	20.33	19.94	19.3	18.74	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.89	0.82	0.7	0.54	0.38	0.41	0.62	0.83	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	457.71	512.01	537.09	525.18	461.82	342.9	236.04	246.67	355.57	435.47	440.73	437.16	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	913.38	892.03	815.27	690.3	534.53	363.03	240.4	252.66	391.34	586.38	766.09	913.29	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	339.02	255.37	206.97	118.89	54.1	0	0	0	0	112.28	234.26	354.25	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1675.14	(98)
Space heating requirement in kWh/m²/year		26.11	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1675.14	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1758.89	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1972.25	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2070.87	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.3	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		48.31	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	48.31	(331)
Energy for lighting (calculated in Appendix L)		292.48	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	779.47	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	19.88	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	799.34	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			799.34	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	25.07	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	151.79	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			854.25	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.32	(384)
EI rating (section 14)				89.51	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:15

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64.15m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 12 TF

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.68 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.51 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 12 TF

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64.15	(1a) x	2.55	(2a) =	163.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64.15	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		163.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	21.27	10.64	10.63	x	0.17	=	1.81	14	148.82	(29)
Walls Type2	21.22	2.1	19.12	x	0.21	=	4	30	573.6	(29)
Roof	54.15	0	54.15	x	0.13	=	7.04	9	487.35	(30)
Total area of elements, m²			96.64							(31)
Party wall			39.3	x	0	=	0	20	786	(32)
Party floor			64.15					70	4490.5	(32a)
Internal wall **			117.78					9	1060.02	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.18 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7546.29 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 117.64 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.49 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.67 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	27.1	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	63.77	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	63.66	

Average = Sum(39)$_{1...12}$ /12= 63.67 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.1 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.99 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	92.38	89.02	85.66	82.31	78.95	75.59	75.59	78.95	82.31	85.66	89.02	92.38

Total = Sum(44)$_{1...12}$ = 1007.82 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	137	119.82	123.65	107.8	103.43	89.26	82.71	94.91	96.04	111.93	122.18	132.68

Total = Sum(45)$_{1...12}$ = 1321.41 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.55	17.97	18.55	16.17	15.52	13.39	12.41	14.24	14.41	16.79	18.33	19.9

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	

Output from water heater (annual)$_{1...12}$ 1972.25 (64)

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

(65)m=	89.77	79.78	85.33	78.64	78.61	72.47	71.72	75.78	74.73	81.44	83.42	88.34	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	(66)

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

(67)m=	16.56	14.71	11.96	9.06	6.77	5.72	6.18	8.03	10.77	13.68	15.97	17.02	(67)

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

(68)m=	183.28	185.18	180.39	170.19	157.31	145.2	137.11	135.21	140.01	150.21	163.09	175.19	(68)

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

(69)m=	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	(71)

Water heating gains (Table 5)

(72)m=	120.66	118.72	114.7	109.22	105.66	100.66	96.4	101.85	103.79	109.46	115.86	118.73	(72)

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

(73)m=	374.95	373.06	361.49	342.9	324.18	306.02	294.13	299.54	309.01	327.79	349.36	365.39	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.64	x	36.79	x	0.48	x	0.8	=	104.18	(77)
Southeast 0.9x	0.77	x	10.64	x	62.67	x	0.48	x	0.8	=	177.46	(77)
Southeast 0.9x	0.77	x	10.64	x	85.75	x	0.48	x	0.8	=	242.8	(77)
Southeast 0.9x	0.77	x	10.64	x	106.25	x	0.48	x	0.8	=	300.84	(77)
Southeast 0.9x	0.77	x	10.64	x	119.01	x	0.48	x	0.8	=	336.97	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	10.64	x	118.15	x	0.48	x	0.8	=	334.53	(77)
Southeast 0.9x	0.77	x	10.64	x	113.91	x	0.48	x	0.8	=	322.53	(77)
Southeast 0.9x	0.77	x	10.64	x	104.39	x	0.48	x	0.8	=	295.57	(77)
Southeast 0.9x	0.77	x	10.64	x	92.85	x	0.48	x	0.8	=	262.9	(77)
Southeast 0.9x	0.77	x	10.64	x	69.27	x	0.48	x	0.8	=	196.13	(77)
Southeast 0.9x	0.77	x	10.64	x	44.07	x	0.48	x	0.8	=	124.78	(77)
Southeast 0.9x	0.77	x	10.64	x	31.49	x	0.48	x	0.8	=	89.16	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	479.13	550.51	604.29	643.75	661.15	640.55	616.66	595.11	571.92	523.92	474.14	454.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.93	0.89	0.82	0.72	0.57	0.43	0.46	0.65	0.84	0.93	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.39	19.64	19.98	20.37	20.69	20.89	20.97	20.96	20.83	20.41	19.83	19.32	(87)

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

(88)m=	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.92	0.88	0.8	0.68	0.51	0.35	0.38	0.59	0.81	0.92	0.96	(89)

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

(90)m=	17.95	18.31	18.79	19.32	19.75	19.99	20.07	20.06	19.92	19.4	18.57	17.85	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.49	18.81	19.24	19.72	20.1	20.33	20.41	20.4	20.27	19.78	19.05	18.41	(92)

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

(93)m=	18.49	18.81	19.24	19.72	20.1	20.33	20.41	20.4	20.27	19.78	19.05	18.41	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.86	0.79	0.68	0.52	0.38	0.41	0.6	0.8	0.9	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	447.3	497.73	519.45	506.37	446.85	336.22	234.81	244.67	345.92	419.95	428.4	427.97	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	905.1	885.64	811.09	688.56	535.05	364.95	242.41	254.62	392.51	584.57	760.6	904.5	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	340.6	260.67	216.98	131.18	65.62	0	0	0	0	122.48	239.18	354.54	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1731.25	(98)
Space heating requirement in kWh/m²/year		26.99	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1731.25	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1817.81	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1972.25	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2070.87	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.89	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		48.31	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	48.31	(331)
Energy for lighting (calculated in Appendix L)		292.48	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	791.46	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.18	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	811.64	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			811.64	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	25.07	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	151.79	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			866.54	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.51	(384)
EI rating (section 14)				89.36	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:45

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64.15m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 12

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.61 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.29 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	26.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 12

Address : P 2 12, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64.15 (1a)	x	2.55 (2a)	=	163.58	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64.15 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	163.58	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	21.27	10.64	10.63	x	0.17	=	1.81	14	148.82	(29)
Walls Type2	21.22	2.1	19.12	x	0.21	=	4	30	573.6	(29)
Total area of elements, m²			42.49							(31)
Party wall			39.3	x	0	=	0	20	786	(32)
Party floor			64.15					70	4490.5	(32a)
Party ceiling			64.15					30	1924.5	(32b)
Internal wall **			117.78					9	1060.02	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 21.14 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8983.44 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 140.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 2.97 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 24.12 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	27.1	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	26.99	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	51.21	51.11	51.11	51.11	51.11	51.11	51.11	51.11	51.11	51.11	51.11	51.11	

Average = Sum(39)$_{1...12}$ /12= 51.12 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.1 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.99 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	92.38	89.02	85.66	82.31	78.95	75.59	75.59	78.95	82.31	85.66	89.02	92.38

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

Total = Sum(44)$_{1...12}$ = 1007.82 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	137	119.82	123.65	107.8	103.43	89.26	82.71	94.91	96.04	111.93	122.18	132.68

Total = Sum(45)$_{1...12}$ = 1321.41 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.55	17.97	18.55	16.17	15.52	13.39	12.41	14.24	14.41	16.79	18.33	19.9

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.28	169.75	178.92	161.29	158.71	142.75	137.99	150.19	149.54	167.21	175.67	187.96	

Output from water heater (annual)$_{1...12}$ 1972.25 (64)

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

(65)m=	89.77	79.78	85.33	78.64	78.61	72.47	71.72	75.78	74.73	81.44	83.42	88.34	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	104.81	(66)

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

(67)m=	16.56	14.71	11.96	9.06	6.77	5.72	6.18	8.03	10.77	13.68	15.97	17.02	(67)

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

(68)m=	183.28	185.18	180.39	170.19	157.31	145.2	137.11	135.21	140.01	150.21	163.09	175.19	(68)

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

(69)m=	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	33.48	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	-83.85	(71)

Water heating gains (Table 5)

(72)m=	120.66	118.72	114.7	109.22	105.66	100.66	96.4	101.85	103.79	109.46	115.86	118.73	(72)

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

(73)m=	374.95	373.06	361.49	342.9	324.18	306.02	294.13	299.54	309.01	327.79	349.36	365.39	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	10.64	x	36.79	x	0.48	x	0.8	=	104.18	(77)
Southeast 0.9x	0.77	x	10.64	x	62.67	x	0.48	x	0.8	=	177.46	(77)
Southeast 0.9x	0.77	x	10.64	x	85.75	x	0.48	x	0.8	=	242.8	(77)
Southeast 0.9x	0.77	x	10.64	x	106.25	x	0.48	x	0.8	=	300.84	(77)
Southeast 0.9x	0.77	x	10.64	x	119.01	x	0.48	x	0.8	=	336.97	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	10.64	x	118.15	x	0.48	x	0.8	=	334.53	(77)
Southeast 0.9x	0.77	x	10.64	x	113.91	x	0.48	x	0.8	=	322.53	(77)
Southeast 0.9x	0.77	x	10.64	x	104.39	x	0.48	x	0.8	=	295.57	(77)
Southeast 0.9x	0.77	x	10.64	x	92.85	x	0.48	x	0.8	=	262.9	(77)
Southeast 0.9x	0.77	x	10.64	x	69.27	x	0.48	x	0.8	=	196.13	(77)
Southeast 0.9x	0.77	x	10.64	x	44.07	x	0.48	x	0.8	=	124.78	(77)
Southeast 0.9x	0.77	x	10.64	x	31.49	x	0.48	x	0.8	=	89.16	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	479.13	550.51	604.29	643.75	661.15	640.55	616.66	595.11	571.92	523.92	474.14	454.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.93	0.88	0.79	0.66	0.5	0.36	0.39	0.58	0.82	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.02	20.23	20.48	20.73	20.9	20.98	21	20.99	20.95	20.74	20.33	19.96	(87)

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

(88)m=	20.25	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.92	0.87	0.77	0.62	0.44	0.3	0.33	0.53	0.78	0.92	0.96	(89)

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

(90)m=	18.94	19.24	19.6	19.94	20.15	20.24	20.25	20.25	20.21	19.96	19.4	18.86	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.35	19.62	19.93	20.24	20.43	20.52	20.53	20.53	20.49	20.25	19.75	19.27	(92)

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

(93)m=	19.35	19.62	19.93	20.24	20.43	20.52	20.53	20.53	20.49	20.25	19.75	19.27	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.91	0.86	0.76	0.63	0.46	0.32	0.35	0.55	0.78	0.91	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	452.91	501.99	518.2	492.36	415.18	295.68	199.89	209.52	313.09	411.05	432.11	433.49	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	770.71	752.13	686.54	579.41	446.4	302.36	201.04	211.18	326.75	493.31	646.49	770.38	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	236.45	168.09	125.24	62.68	23.23	0	0	0	0	61.2	154.35	250.64	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1081.88	(98)
Space heating requirement in kWh/m²/year		16.86	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1081.88	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1135.98	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1972.25	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2070.87	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.07	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		48.31	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	48.31	(331)
Energy for lighting (calculated in Appendix L)		292.48	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	652.69	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.64	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	669.33	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			669.33	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	25.07	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	151.79	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			724.23	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.29	(384)
EI rating (section 14)				91.11	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:22

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.89m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 13 GF

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.95 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.42 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.56m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 13 GF

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.89	(1a) x	2.55	(2a) =	178.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.89	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.22	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Floor			69.89	x	0.12	=	8.3868	75	5241.75	(28)
Walls Type1	28.38	12.56	15.82	x	0.17	=	2.69	14	221.48	(29)
Walls Type2	28.41	2.1	26.31	x	0.21	=	5.51	30	789.3	(29)
Total area of elements, m²			126.68							(31)
Party wall			32.03	x	0	=	0	20	640.6	(32)
Party ceiling			69.89					30	2096.7	(32b)
Internal wall **			128.32					9	1154.88	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.11 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10144.71 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 145.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.37 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.49 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.52	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	71.01	70.89	70.89	70.89	70.89	70.89	70.89	70.89	70.89	70.89	70.89	70.89	

Average = Sum(39)$_{1...12}$ /12= 70.9 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.48 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.23	92.73	89.23	85.73	82.23	78.73	78.73	82.23	85.73	89.23	92.73	96.23

Total = Sum(44)$_{1...12}$ = 1049.78 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.71	124.81	128.79	112.29	107.74	92.97	86.15	98.86	100.04	116.59	127.27	138.2

Total = Sum(45)$_{1...12}$ = 1376.43 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.41	18.72	19.32	16.84	16.16	13.95	12.92	14.83	15.01	17.49	19.09	20.73

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	

Output from water heater (annual)$_{1...12}$ 2027.27 (64)

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

(65)m=	91.67	81.44	87.05	80.13	80.05	73.71	72.87	77.09	76.06	82.99	85.11	90.17	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	(66)

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

(67)m=	17.65	15.67	12.75	9.65	7.21	6.09	6.58	8.55	11.48	14.58	17.01	18.14	(67)

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

(68)m=	197.04	199.08	193.93	182.96	169.12	156.1	147.41	145.36	150.52	161.49	175.33	188.35	(68)

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

(69)m=	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	(71)

Water heating gains (Table 5)

(72)m=	123.21	121.19	117	111.29	107.59	102.37	97.94	103.62	105.64	111.54	118.21	121.2	(72)

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

(73)m=	394.55	392.6	380.33	360.56	340.57	321.22	308.58	314.19	324.29	344.26	367.21	384.34	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(77)
Southeast 0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(77)
Southeast 0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(77)
Southeast 0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(77)
Southeast 0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	12.56	x	118.15	x	0.48	x	0.8	=	394.9	(77)
Southeast 0.9x	0.77	x	12.56	x	113.91	x	0.48	x	0.8	=	380.73	(77)
Southeast 0.9x	0.77	x	12.56	x	104.39	x	0.48	x	0.8	=	348.91	(77)
Southeast 0.9x	0.77	x	12.56	x	92.85	x	0.48	x	0.8	=	310.35	(77)
Southeast 0.9x	0.77	x	12.56	x	69.27	x	0.48	x	0.8	=	231.52	(77)
Southeast 0.9x	0.77	x	12.56	x	44.07	x	0.48	x	0.8	=	147.3	(77)
Southeast 0.9x	0.77	x	12.56	x	31.49	x	0.48	x	0.8	=	105.24	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	517.53	602.08	666.94	715.69	738.35	716.12	689.31	663.1	634.63	575.77	514.51	489.58	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.92	0.85	0.74	0.58	0.44	0.47	0.67	0.87	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.58	19.81	20.13	20.48	20.76	20.93	20.98	20.97	20.87	20.51	19.97	19.51	(87)

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

(88)m=	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.9	0.82	0.69	0.51	0.35	0.38	0.61	0.84	0.94	0.97	(89)

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

(90)m=	18.18	18.52	18.97	19.45	19.82	20.01	20.06	20.06	19.96	19.5	18.74	18.09	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.71	19.01	19.41	19.84	20.18	20.36	20.41	20.4	20.3	19.88	19.21	18.63	(92)

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

(93)m=	18.71	19.01	19.41	19.84	20.18	20.36	20.41	20.4	20.3	19.88	19.21	18.63	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.89	0.82	0.7	0.54	0.38	0.42	0.62	0.83	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	495.28	560.61	592.97	583.56	515.42	383.89	264.68	276.43	396.55	480.21	479.45	471.66	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1023.21	1000.47	915.28	775.72	601.08	408.24	270.13	283.92	439.83	658.07	858.48	1022.96	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	392.78	295.59	239.8	138.36	63.73	0	0	0	0	132.32	272.91	410.16	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1945.66	(98)
Space heating requirement in kWh/m²/year		27.84	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1945.66	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2042.94	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2027.27	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2128.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	41.72	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.63	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.63	(331)
Energy for lighting (calculated in Appendix L)		311.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	849.04	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.65	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	870.69	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			870.69	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.31	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			937.77	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.42	(384)
EI rating (section 14)				89.06	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:06

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.89m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 13 TF

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.49 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.90 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 13 TF

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.89	(1a) x	2.55	(2a) =	178.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.89	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.22	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x	1/[1/(1.2)+ 0.04]	=	14.38			(27)
Walls Type1	28.38	12.56	15.82	x	0.17	=	2.69	14	221.48	(29)
Walls Type2	28.41	2.1	26.31	x	0.21	=	5.51	30	789.3	(29)
Roof	69.89	0	69.89	x	0.13	=	9.09	9	629.01	(30)
Total area of elements, m²			126.68							(31)
Party wall			32.03	x	0	=	0	20	640.6	(32)
Party floor			69.89					70	4892.3	(32a)
Internal wall **			128.32					9	1154.88	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.81 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8327.57 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 119.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 44.43 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.52	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.96	73.84	73.84	73.84	73.84	73.84	73.84	73.84	73.84	73.84	73.84	73.84	

Average = Sum(39)$_{1...12}$ /12= 73.85 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06

Average = Sum(40)$_{1...12}$ /12= 1.06 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.48 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.23	92.73	89.23	85.73	82.23	78.73	78.73	82.23	85.73	89.23	92.73	96.23

Total = Sum(44)$_{1...12}$ = 1049.78 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.71	124.81	128.79	112.29	107.74	92.97	86.15	98.86	100.04	116.59	127.27	138.2

Total = Sum(45)$_{1...12}$ = 1376.43 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.41	18.72	19.32	16.84	16.16	13.95	12.92	14.83	15.01	17.49	19.09	20.73

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	

Output from water heater (annual)$_{1...12}$ 2027.27 (64)

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

(65)m=	91.67	81.44	87.05	80.13	80.05	73.71	72.87	77.09	76.06	82.99	85.11	90.17	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	(66)

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

(67)m=	17.65	15.67	12.75	9.65	7.21	6.09	6.58	8.55	11.48	14.58	17.01	18.14	(67)

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

(68)m=	197.04	199.08	193.93	182.96	169.12	156.1	147.41	145.36	150.52	161.49	175.33	188.35	(68)

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

(69)m=	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	(71)

Water heating gains (Table 5)

(72)m=	123.21	121.19	117	111.29	107.59	102.37	97.94	103.62	105.64	111.54	118.21	121.2	(72)

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

(73)m=	394.55	392.6	380.33	360.56	340.57	321.22	308.58	314.19	324.29	344.26	367.21	384.34	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(77)
Southeast 0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(77)
Southeast 0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(77)
Southeast 0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(77)
Southeast 0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	12.56	x	118.15	x	0.48	x	0.8	=	394.9	(77)
Southeast 0.9x	0.77	x	12.56	x	113.91	x	0.48	x	0.8	=	380.73	(77)
Southeast 0.9x	0.77	x	12.56	x	104.39	x	0.48	x	0.8	=	348.91	(77)
Southeast 0.9x	0.77	x	12.56	x	92.85	x	0.48	x	0.8	=	310.35	(77)
Southeast 0.9x	0.77	x	12.56	x	69.27	x	0.48	x	0.8	=	231.52	(77)
Southeast 0.9x	0.77	x	12.56	x	44.07	x	0.48	x	0.8	=	147.3	(77)
Southeast 0.9x	0.77	x	12.56	x	31.49	x	0.48	x	0.8	=	105.24	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	517.53	602.08	666.94	715.69	738.35	716.12	689.31	663.1	634.63	575.77	514.51	489.58	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.9	0.83	0.73	0.58	0.45	0.48	0.67	0.85	0.94	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.26	19.52	19.89	20.3	20.65	20.87	20.96	20.95	20.8	20.34	19.72	19.19	(87)

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

(88)m=	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.93	0.88	0.81	0.68	0.52	0.36	0.39	0.6	0.82	0.93	0.96	(89)

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

(90)m=	17.72	18.1	18.61	19.19	19.65	19.92	20.01	20	19.84	19.26	18.38	17.62	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.3	18.64	19.1	19.61	20.03	20.28	20.37	20.36	20.21	19.68	18.89	18.22	(92)

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

(93)m=	18.3	18.64	19.1	19.61	20.03	20.28	20.37	20.36	20.21	19.68	18.89	18.22	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.94	0.91	0.86	0.79	0.68	0.53	0.39	0.42	0.62	0.81	0.91	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	485.18	546.68	576.09	566.59	504.08	382.16	268.14	279	390.6	466.03	467.57	462.76	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1035.66	1014.68	930.29	790.71	615.14	419.76	278.5	292.54	450.97	670.12	870.5	1034.86	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	409.56	314.49	263.53	161.37	82.62	0	0	0	0	151.85	290.11	425.64	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2099.17	(98)
Space heating requirement in kWh/m²/year		30.04	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2099.17	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2204.13	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2027.27	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2128.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	43.33	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.63	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.63	(331)
Energy for lighting (calculated in Appendix L)		311.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	881.85	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.49	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	904.33	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			904.33	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.31	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			971.41	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.9	(384)
EI rating (section 14)				88.67	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:36

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.89m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 13

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.42 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	32.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	28.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 13

Address : P 2 13 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.89 (1a)	x	2.55 (2a)	=	178.22	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.89 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	178.22	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	28.38	12.56	15.82	x	0.17	=	2.69	14	221.48	(29)
Walls Type2	28.41	2.1	26.31	x	0.21	=	5.51	30	789.3	(29)
Total area of elements, m²			56.79							(31)
Party wall			32.03	x	0	=	0	20	640.6	(32)
Party floor			69.89					70	4892.3	(32a)
Party ceiling			69.89					30	2096.7	(32b)
Internal wall **			128.32					9	1154.88	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.73 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9795.26 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 140.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 28.94 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.52	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.46	58.35	58.35	58.35	58.35	58.35	58.35	58.35	58.35	58.35	58.35	58.35	

Average = Sum(39)$_{1...12}$ /12= 58.36 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.84	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Average = Sum(40)$_{1...12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.48 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.23	92.73	89.23	85.73	82.23	78.73	78.73	82.23	85.73	89.23	92.73	96.23

Total = Sum(44)$_{1...12}$ = 1049.78 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.71	124.81	128.79	112.29	107.74	92.97	86.15	98.86	100.04	116.59	127.27	138.2

Total = Sum(45)$_{1...12}$ = 1376.43 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.41	18.72	19.32	16.84	16.16	13.95	12.92	14.83	15.01	17.49	19.09	20.73

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.98	174.74	184.07	165.78	163.02	146.47	141.43	154.14	153.54	171.87	180.76	193.48	

Output from water heater (annual)$_{1...12}$ 2027.27 (64)

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

(65)m=	91.67	81.44	87.05	80.13	80.05	73.71	72.87	77.09	76.06	82.99	85.11	90.17	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	112.17	(66)

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

(67)m=	17.65	15.67	12.75	9.65	7.21	6.09	6.58	8.55	11.48	14.58	17.01	18.14	(67)

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

(68)m=	197.04	199.08	193.93	182.96	169.12	156.1	147.41	145.36	150.52	161.49	175.33	188.35	(68)

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

(69)m=	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	34.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	-89.74	(71)

Water heating gains (Table 5)

(72)m=	123.21	121.19	117	111.29	107.59	102.37	97.94	103.62	105.64	111.54	118.21	121.2	(72)

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

(73)m=	394.55	392.6	380.33	360.56	340.57	321.22	308.58	314.19	324.29	344.26	367.21	384.34	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(77)
Southeast 0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(77)
Southeast 0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(77)
Southeast 0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(77)
Southeast 0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	12.56	x	118.15	x	0.48	x	0.8	=	394.9	(77)
Southeast	0.9x	0.77	x	12.56	x	113.91	x	0.48	x	0.8	=	380.73	(77)
Southeast	0.9x	0.77	x	12.56	x	104.39	x	0.48	x	0.8	=	348.91	(77)
Southeast	0.9x	0.77	x	12.56	x	92.85	x	0.48	x	0.8	=	310.35	(77)
Southeast	0.9x	0.77	x	12.56	x	69.27	x	0.48	x	0.8	=	231.52	(77)
Southeast	0.9x	0.77	x	12.56	x	44.07	x	0.48	x	0.8	=	147.3	(77)
Southeast	0.9x	0.77	x	12.56	x	31.49	x	0.48	x	0.8	=	105.24	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	517.53	602.08	666.94	715.69	738.35	716.12	689.31	663.1	634.63	575.77	514.51	489.58	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.89	0.8	0.67	0.5	0.37	0.4	0.59	0.82	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.92	20.15	20.43	20.7	20.88	20.97	20.99	20.99	20.94	20.7	20.26	19.86	(87)

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

(88)m=	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.87	0.77	0.62	0.45	0.31	0.33	0.54	0.79	0.93	0.97	(89)

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

(90)m=	18.78	19.11	19.49	19.86	20.1	20.2	20.22	20.22	20.17	19.88	19.27	18.69	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.22	19.51	19.85	20.18	20.4	20.49	20.51	20.51	20.47	20.19	19.64	19.14	(92)

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

(93)m=	19.22	19.51	19.85	20.18	20.4	20.49	20.51	20.51	20.47	20.19	19.64	19.14	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.86	0.77	0.63	0.47	0.33	0.36	0.56	0.79	0.92	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	490.95	551.05	574.37	550.51	467.69	334.86	226.75	237.58	353.19	456.41	471.49	468.41	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	872.13	852.25	778.88	658.18	507.59	343.85	228.39	239.94	371.42	559.67	731.94	871.61	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	283.6	202.41	152.15	77.52	29.69	0	0	0	0	76.83	187.53	299.98	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1309.7	(98)
Space heating requirement in kWh/m²/year		18.74	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1309.7	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1375.19	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2027.27	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2128.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	35.04	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.63	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.63	(331)
Energy for lighting (calculated in Appendix L)		311.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	713.13	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.18	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	731.32	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			731.32	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.31	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			798.4	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.42	(384)
EI rating (section 14)				90.69	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:14

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.12m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 3 GF

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.01 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	36.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South West	12.56m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 3 GF

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.12	(1a) x	2.55	(2a) =	178.81	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.12	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.81	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Floor			70.12	x	0.12	=	8.4144	75	5259	(28)
Walls Type1	43.96	12.56	31.4	x	0.17	=	5.34	14	439.6	(29)
Walls Type2	4.49	2.1	2.39	x	0.21	=	0.5	30	71.7	(29)
Total area of elements, m²			118.57							(31)
Party wall			36.95	x	0	=	0	20	739	(32)
Party ceiling			70.12					30	2103.6	(32b)
Internal wall **			128.74					9	1158.66	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 31.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9771.56 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 139.35 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.42 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 39.21 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.62	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	68.83	68.71	68.71	68.71	68.71	68.71	68.71	68.71	68.71	68.71	68.71	68.71	

Average = Sum(39)$_{1...12}$ /12= 68.72 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98

Average = Sum(40)$_{1...12}$ /12= 0.98 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.61 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.38	92.87	89.37	85.86	82.36	78.85	78.85	82.36	85.86	89.37	92.87	96.38

Total = Sum(44)$_{1...12}$ = 1051.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.92	125	128.99	112.46	107.9	93.11	86.28	99.01	100.19	116.77	127.46	138.41

Total = Sum(45)$_{1...12}$ = 1378.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.44	18.75	19.35	16.87	16.19	13.97	12.94	14.85	15.03	17.51	19.12	20.76

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	

Output from water heater (annual)$_{1...12}$ 2029.36 (64)

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

(65)m=	91.74	81.5	87.11	80.19	80.1	73.76	72.91	77.14	76.11	83.05	85.18	90.24	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	(66)

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

(67)m=	17.7	15.72	12.78	9.68	7.23	6.11	6.6	8.58	11.51	14.62	17.06	18.19	(67)

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

(68)m=	197.58	199.63	194.46	183.46	169.58	156.53	147.81	145.76	150.93	161.93	175.81	188.86	(68)

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

(69)m=	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	(71)

Water heating gains (Table 5)

(72)m=	123.31	121.29	117.08	111.37	107.66	102.44	98	103.69	105.71	111.62	118.3	121.3	(72)

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

(73)m=	395.32	393.37	381.06	361.25	341.21	321.81	309.14	314.76	324.88	344.9	367.91	385.08	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(79)
Southwest0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(79)
Southwest0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(79)
Southwest0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(79)
Southwest0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(79)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	12.56	x	118.15		0.48	x	0.8	=	394.9	(79)
Southwest	0.9x	0.77	x	12.56	x	113.91		0.48	x	0.8	=	380.73	(79)
Southwest	0.9x	0.77	x	12.56	x	104.39		0.48	x	0.8	=	348.91	(79)
Southwest	0.9x	0.77	x	12.56	x	92.85		0.48	x	0.8	=	310.35	(79)
Southwest	0.9x	0.77	x	12.56	x	69.27		0.48	x	0.8	=	231.52	(79)
Southwest	0.9x	0.77	x	12.56	x	44.07		0.48	x	0.8	=	147.3	(79)
Southwest	0.9x	0.77	x	12.56	x	31.49		0.48	x	0.8	=	105.24	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	518.3	602.85	667.68	716.38	738.99	716.71	689.87	663.67	635.23	576.42	515.21	490.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.91	0.84	0.72	0.57	0.43	0.46	0.66	0.86	0.95	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.6	19.84	20.16	20.5	20.77	20.93	20.98	20.98	20.88	20.53	19.99	19.54	(87)

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

(88)m=	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.94	0.89	0.81	0.68	0.5	0.34	0.38	0.59	0.83	0.94	0.97	(89)

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

(90)m=	18.24	18.58	19.03	19.5	19.86	20.04	20.09	20.08	19.99	19.55	18.8	18.14	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.71	19.02	19.42	19.85	20.18	20.35	20.4	20.4	20.3	19.89	19.22	18.63	(92)

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

(93)m=	18.71	19.02	19.42	19.85	20.18	20.35	20.4	20.4	20.3	19.89	19.22	18.63	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.88	0.8	0.68	0.52	0.37	0.4	0.61	0.82	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	493.61	557.34	587.51	575.28	504.82	373.47	256.35	267.93	387.05	473.97	476.7	470.38	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	991.99	970.33	887.97	752.5	582.68	395.24	261.16	274.55	426.04	638.29	832.53	991.53	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	370.79	277.53	223.54	127.6	57.93	0	0	0	0	122.26	256.2	387.74	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1823.58	(98)
Space heating requirement in kWh/m²/year		26.01	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1823.58	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1914.76	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2029.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2130.83	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	40.46	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.8	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.8	(331)
Energy for lighting (calculated in Appendix L)		312.56	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	823.4	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	844.39	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			844.39	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.4	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	162.22	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			912.05	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.01	(384)
EI rating (section 14)				89.38	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:58

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.12m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 3 TF

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.43 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 3 TF

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.12	(1a) x	2.55	(2a) =	178.81	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.12	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.81	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	43.96	12.56	31.4	x	0.17	=	5.34	14	439.6	(29)
Walls Type2	4.49	2.1	2.39	x	0.21	=	0.5	30	71.7	(29)
Roof	70.12	0	70.12	x	0.13	=	9.12	9	631.08	(30)
Total area of elements, m²			118.57							(31)
Party wall			36.95	x	0	=	0	20	739	(32)
Party floor			70.12					70	4908.4	(32a)
Internal wall **			128.74					9	1158.66	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7948.44 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 113.35 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.23 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.72 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.62	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	71.34	71.22	71.22	71.22	71.22	71.22	71.22	71.22	71.22	71.22	71.22	71.22	

Average = Sum(39)$_{1...12}$ /12= 71.23 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.61 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	96.38	92.87	89.37	85.86	82.36	78.85	78.85	82.36	85.86	89.37	92.87	96.38	

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

Total = Sum(44)$_{1...12}$ = 1051.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	142.92	125	128.99	112.46	107.9	93.11	86.28	99.01	100.19	116.77	127.46	138.41	

Total = Sum(45)$_{1...12}$ = 1378.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	21.44	18.75	19.35	16.87	16.19	13.97	12.94	14.85	15.03	17.51	19.12	20.76	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	

Output from water heater (annual)$_{1...12}$ 2029.36 (64)

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

(65)m=	91.74	81.5	87.11	80.19	80.1	73.76	72.91	77.14	76.11	83.05	85.18	90.24	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	(66)

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

(67)m=	17.7	15.72	12.78	9.68	7.23	6.11	6.6	8.58	11.51	14.62	17.06	18.19	(67)

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

(68)m=	197.58	199.63	194.46	183.46	169.58	156.53	147.81	145.76	150.93	161.93	175.81	188.86	(68)

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

(69)m=	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	(71)

Water heating gains (Table 5)

(72)m=	123.31	121.29	117.08	111.37	107.66	102.44	98	103.69	105.71	111.62	118.3	121.3	(72)

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

(73)m=	395.32	393.37	381.06	361.25	341.21	321.81	309.14	314.76	324.88	344.9	367.91	385.08	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(79)
Southwest0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(79)
Southwest0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(79)
Southwest0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(79)
Southwest0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(79)

DER WorkSheet: New dwelling design stage

Southwest 0.9x	0.77	x	12.56	x	118.15		0.48	x	0.8	=	394.9	(79)
Southwest 0.9x	0.77	x	12.56	x	113.91		0.48	x	0.8	=	380.73	(79)
Southwest 0.9x	0.77	x	12.56	x	104.39		0.48	x	0.8	=	348.91	(79)
Southwest 0.9x	0.77	x	12.56	x	92.85		0.48	x	0.8	=	310.35	(79)
Southwest 0.9x	0.77	x	12.56	x	69.27		0.48	x	0.8	=	231.52	(79)
Southwest 0.9x	0.77	x	12.56	x	44.07		0.48	x	0.8	=	147.3	(79)
Southwest 0.9x	0.77	x	12.56	x	31.49		0.48	x	0.8	=	105.24	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	518.3	602.85	667.68	716.38	738.99	716.71	689.87	663.67	635.23	576.42	515.21	490.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.95	0.93	0.89	0.82	0.71	0.57	0.43	0.46	0.65	0.84	0.93	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.28	19.55	19.92	20.32	20.66	20.88	20.96	20.95	20.81	20.37	19.74	19.21	(87)

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

(88)m=	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.92	0.87	0.79	0.67	0.5	0.35	0.38	0.59	0.81	0.92	0.95	(89)

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

(90)m=	17.78	18.17	18.68	19.25	19.7	19.96	20.05	20.04	19.89	19.32	18.44	17.68	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.31	18.65	19.11	19.62	20.04	20.28	20.37	20.36	20.21	19.69	18.9	18.22	(92)

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

(93)m=	18.31	18.65	19.11	19.62	20.04	20.28	20.37	20.36	20.21	19.69	18.9	18.22	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.85	0.78	0.67	0.52	0.38	0.41	0.6	0.8	0.9	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	482.41	542.08	569.23	557.09	492.54	370.86	258.93	269.66	380.36	458.74	463.69	460.47	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	999.22	979.5	898.41	763.67	593.78	404.71	268.16	281.74	435.02	647.12	840.23	998.19	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	384.51	293.95	244.91	148.74	75.32	0	0	0	0	140.15	271.11	400.07	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1958.75	(98)
Space heating requirement in kWh/m²/year		27.93	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1958.75	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2056.69	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2029.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2130.83	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	41.88	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.8	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.8	(331)
Energy for lighting (calculated in Appendix L)		312.56	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	852.28	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.73	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	874.02	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			874.02	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.4	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	162.22	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			941.67	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.43	(384)
EI rating (section 14)				89.04	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:28

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.12m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 3

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.41 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.06 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	32.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 3

Address : P 2 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.12	(1a) x	2.55	(2a) =	178.81	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.12	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.81	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	43.96	12.56	31.4	x	0.17	=	5.34	14	439.6	(29)
Walls Type2	4.49	2.1	2.39	x	0.21	=	0.5	30	71.7	(29)
Total area of elements, m²			48.45							(31)
Party wall			36.95	x	0	=	0	20	739	(32)
Party floor			70.12					70	4908.4	(32a)
Party ceiling			70.12					30	2103.6	(32b)
Internal wall **			128.74					9	1158.66	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9420.96 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 134.35 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.31 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 26.68 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.62	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	56.3	56.19	56.19	56.19	56.19	56.19	56.19	56.19	56.19	56.19	56.19	56.19	

Average = Sum(39)$_{1...12}$ /12= 56.2 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.61 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	96.38	92.87	89.37	85.86	82.36	78.85	78.85	82.36	85.86	89.37	92.87	96.38

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

Total = Sum(44)$_{1...12}$ = 1051.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.92	125	128.99	112.46	107.9	93.11	86.28	99.01	100.19	116.77	127.46	138.41

Total = Sum(45)$_{1...12}$ = 1378.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.44	18.75	19.35	16.87	16.19	13.97	12.94	14.85	15.03	17.51	19.12	20.76

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.2	174.93	184.27	165.95	163.18	146.61	141.56	154.29	153.69	172.04	180.95	193.69	

Output from water heater (annual)$_{1...12}$ 2029.36 (64)

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

(65)m=	91.74	81.5	87.11	80.19	80.1	73.76	72.91	77.14	76.11	83.05	85.18	90.24	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	112.45	(66)

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

(67)m=	17.7	15.72	12.78	9.68	7.23	6.11	6.6	8.58	11.51	14.62	17.06	18.19	(67)

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

(68)m=	197.58	199.63	194.46	183.46	169.58	156.53	147.81	145.76	150.93	161.93	175.81	188.86	(68)

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

(69)m=	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.25	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	-89.96	(71)

Water heating gains (Table 5)

(72)m=	123.31	121.29	117.08	111.37	107.66	102.44	98	103.69	105.71	111.62	118.3	121.3	(72)

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

(73)m=	395.32	393.37	381.06	361.25	341.21	321.81	309.14	314.76	324.88	344.9	367.91	385.08	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	12.56	x	36.79	x	0.48	x	0.8	=	122.98	(79)
Southwest0.9x	0.77	x	12.56	x	62.67	x	0.48	x	0.8	=	209.48	(79)
Southwest0.9x	0.77	x	12.56	x	85.75	x	0.48	x	0.8	=	286.62	(79)
Southwest0.9x	0.77	x	12.56	x	106.25	x	0.48	x	0.8	=	355.13	(79)
Southwest0.9x	0.77	x	12.56	x	119.01	x	0.48	x	0.8	=	397.78	(79)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	12.56	x	118.15		0.48	x	0.8	=	394.9	(79)
Southwest	0.9x	0.77	x	12.56	x	113.91		0.48	x	0.8	=	380.73	(79)
Southwest	0.9x	0.77	x	12.56	x	104.39		0.48	x	0.8	=	348.91	(79)
Southwest	0.9x	0.77	x	12.56	x	92.85		0.48	x	0.8	=	310.35	(79)
Southwest	0.9x	0.77	x	12.56	x	69.27		0.48	x	0.8	=	231.52	(79)
Southwest	0.9x	0.77	x	12.56	x	44.07		0.48	x	0.8	=	147.3	(79)
Southwest	0.9x	0.77	x	12.56	x	31.49		0.48	x	0.8	=	105.24	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.98	209.48	286.62	355.13	397.78	394.9	380.73	348.91	310.35	231.52	147.3	105.24	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	518.3	602.85	667.68	716.38	738.99	716.71	689.87	663.67	635.23	576.42	515.21	490.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.93	0.88	0.78	0.65	0.49	0.35	0.38	0.58	0.81	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.96	20.19	20.46	20.72	20.9	20.97	20.99	20.99	20.95	20.72	20.29	19.9	(87)

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

(88)m=	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.92	0.86	0.75	0.61	0.43	0.3	0.32	0.52	0.78	0.92	0.96	(89)

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

(90)m=	18.86	19.19	19.57	19.92	20.14	20.23	20.25	20.25	20.21	19.93	19.34	18.77	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.25	19.54	19.88	20.2	20.4	20.49	20.51	20.51	20.47	20.21	19.67	19.16	(92)

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

(93)m=	19.25	19.54	19.88	20.2	20.4	20.49	20.51	20.51	20.47	20.21	19.67	19.16	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.94	0.91	0.85	0.75	0.62	0.45	0.32	0.34	0.54	0.78	0.91	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	488.47	546.3	566.61	539.26	454.5	323.35	218.29	228.81	342.04	447.83	467.51	466.47	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	841.5	822.5	751.66	634.84	489.1	330.96	219.65	230.79	357.65	539.86	706.35	840.83	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	262.66	185.61	137.68	68.82	25.74	0	0	0	0	68.47	171.97	278.52	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1199.45	(98)
Space heating requirement in kWh/m²/year		17.11	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1199.45	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1259.43	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2029.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2130.83	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.9	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.8	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.8	(331)
Energy for lighting (calculated in Appendix L)		312.56	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	690.02	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	17.6	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	707.61	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			707.61	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.4	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	162.22	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			775.27	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.06	(384)
EI rating (section 14)				90.98	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:47:05

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.67m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 4 GF

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.23 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.26 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	43.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	12.56m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 4 GF

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.67 (1a)	x	2.55 (2a)	=	180.21	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.67 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	180.21	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x	1/[1/(1.2)+ 0.04]	=	14.38			(27)
Floor			70.67	x	0.12	=	8.480399	75	5300.25	(28)
Walls Type1	28.1	12.56	15.54	x	0.17	=	2.64	14	217.56	(29)
Walls Type2	8.21	2.1	6.11	x	0.21	=	1.28	30	183.3	(29)
Walls Type3	2.52	0	2.52	x	0.2	=	0.51	150	378	(29)
Walls Type4	11.83	0	11.83	x	0.2	=	2.41	150	1774.5	(29)
Total area of elements, m²			121.33							(31)
Party wall			34.96	x	0	=	0	20	699.2	(32)
Party ceiling			70.67					30	2120.1	(32b)
Internal wall **			129.75					9	1167.75	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.86 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11840.66 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 167.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.28 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.14 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.85	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	69.99	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	

Average = Sum(39)$_{1...12}$ /12= 69.88 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.26 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.93 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	96.72	93.2	89.69	86.17	82.65	79.14	79.14	82.65	86.17	89.69	93.2	96.72	

Total = Sum(44)$_{1...12}$ = 1055.15 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	143.44	125.45	129.45	112.86	108.29	93.45	86.59	99.37	100.55	117.19	127.92	138.91	

Total = Sum(45)$_{1...12}$ = 1383.47 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.52	18.82	19.42	16.93	16.24	14.02	12.99	14.91	15.08	17.58	19.19	20.84	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	

Output from water heater (annual)$_{1...12}$ — 2034.31 — (64)

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

(65)m=	91.91	81.65	87.26	80.32	80.23	73.87	73.01	77.26	76.23	83.19	85.33	90.41	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	(66)

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

(67)m=	17.83	15.83	12.88	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.19	18.32	(67)

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

(68)m=	198.86	200.92	195.72	184.65	170.68	157.54	148.77	146.7	151.9	162.97	176.95	190.08	(68)

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

(69)m=	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	(71)

Water heating gains (Table 5)

(72)m=	123.54	121.51	117.29	111.56	107.83	102.59	98.14	103.85	105.87	111.81	118.51	121.52	(72)

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

(73)m=	397.16	395.2	382.82	362.89	342.73	323.22	310.49	316.12	326.31	346.44	369.58	386.85	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest	0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest	0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest	0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest	0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest	0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest	0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest	0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest	0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest	0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest	0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest	0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	434.87	471.96	521.12	590.02	648.04	648.71	614.98	558.87	494.83	440.25	417.03	417.65	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.97	0.92	0.81	0.64	0.49	0.55	0.79	0.95	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.62	19.76	20.05	20.43	20.76	20.93	20.98	20.97	20.83	20.42	19.95	19.58	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.99	0.98	0.96	0.9	0.76	0.56	0.39	0.45	0.73	0.93	0.98	0.99	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.24	18.45	18.86	19.4	19.84	20.04	20.08	20.08	19.94	19.4	18.72	18.18	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	18.72	18.91	19.27	19.76	20.16	20.35	20.4	20.39	20.25	19.75	19.15	18.66	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	18.72	18.91	19.27	19.76	20.16	20.35	20.4	20.39	20.25	19.75	19.15	18.66	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.98	0.97	0.95	0.89	0.77	0.58	0.42	0.48	0.74	0.92	0.97	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	427.13	459.72	496.15	526.16	496.85	378.75	260.5	270.54	368.53	405.94	405.21	411.26	(95)

DER WorkSheet: New dwelling design stage

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1009.02	978.6	892.43	758.86	591.13	401.78	265.21	278.6	429.66	639.41	841.76	1010.68	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	432.92	348.69	294.83	167.54	70.14	0	0	0	0	173.7	314.32	445.97	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2248.11	(98)
Space heating requirement in kWh/m²/year	31.81	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2248.11	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2360.51	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2034.31	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2136.02	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	44.97	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		53.22	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	53.22	(331)
Energy for lighting (calculated in Appendix L)		314.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

DER WorkSheet: New dwelling design stage

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	915.18	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	23.34	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	938.51	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				938.51	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	27.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	163.38	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1		0.52	x 0.01 =		-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1007.55	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.26	(384)
EI rating (section 14)					88.33	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:49

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.67m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 4 TF

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	29.54 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.63 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 4 TF

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.67	(1a) x	2.55	(2a) =	180.21	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.67	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		180.21	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x	1/[1/(1.2)+ 0.04]	=	14.38			(27)
Walls Type1	28.1	12.56	15.54	x	0.17	=	2.64	14	217.56	(29)
Walls Type2	8.21	2.1	6.11	x	0.21	=	1.28	30	183.3	(29)
Walls Type3	2.52	0	2.52	x	0.2	=	0.51	150	378	(29)
Walls Type4	11.83	0	11.83	x	0.2	=	2.41	150	1774.5	(29)
Roof	70.67	0	70.67	x	0.13	=	9.19	9	636.03	(30)
Total area of elements, m²			121.33							(31)
Party wall			34.96	x	0	=	0	20	699.2	(32)
Party floor			70.67					70	4946.9	(32a)
Internal wall **			129.75					9	1167.75	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.57 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10003.24 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 141.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.78 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.85	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.63	72.52	72.52	72.52	72.52	72.52	72.52	72.52	72.52	72.52	72.52	72.52	

Average = Sum(39)$_{1...12}$ /12= 72.52 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.26 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.93 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	96.72	93.2	89.69	86.17	82.65	79.14	79.14	82.65	86.17	89.69	93.2	96.72	

Total = Sum(44)$_{1...12}$ = 1055.15 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	143.44	125.45	129.45	112.86	108.29	93.45	86.59	99.37	100.55	117.19	127.92	138.91	

Total = Sum(45)$_{1...12}$ = 1383.47 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.52	18.82	19.42	16.93	16.24	14.02	12.99	14.91	15.08	17.58	19.19	20.84	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	

Output from water heater (annual)$_{1...12}$ — 2034.31 — (64)

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

(65)m=	91.91	81.65	87.26	80.32	80.23	73.87	73.01	77.26	76.23	83.19	85.33	90.41	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	(66)

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

(67)m=	17.83	15.83	12.88	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.19	18.32	(67)

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

(68)m=	198.86	200.92	195.72	184.65	170.68	157.54	148.77	146.7	151.9	162.97	176.95	190.08	(68)

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

(69)m=	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	(71)

Water heating gains (Table 5)

(72)m=	123.54	121.51	117.29	111.56	107.83	102.59	98.14	103.85	105.87	111.81	118.51	121.52	(72)

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

(73)m=	397.16	395.2	382.82	362.89	342.73	323.22	310.49	316.12	326.31	346.44	369.58	386.85	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest	0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest	0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest	0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest	0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest	0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest	0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest	0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest	0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest	0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest	0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest	0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	434.87	471.96	521.12	590.02	648.04	648.71	614.98	558.87	494.83	440.25	417.03	417.65	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.98	0.96	0.9	0.8	0.64	0.49	0.55	0.78	0.93	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.36	19.52	19.84	20.28	20.67	20.89	20.97	20.95	20.77	20.28	19.74	19.31	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.98	0.97	0.95	0.88	0.75	0.56	0.4	0.46	0.73	0.91	0.97	0.98	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	17.86	18.09	18.56	19.18	19.7	19.97	20.04	20.03	19.84	19.19	18.42	17.79	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	18.38	18.59	19	19.56	20.04	20.29	20.36	20.35	20.16	19.57	18.88	18.32	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	18.38	18.59	19	19.56	20.04	20.29	20.36	20.35	20.16	19.57	18.88	18.32	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.97	0.96	0.94	0.87	0.75	0.58	0.43	0.49	0.73	0.9	0.96	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	422.6	453.72	487.48	514.5	487.65	378.15	264.21	272.76	362.15	397.49	399.66	407.27	(95)

DER WorkSheet: New dwelling design stage

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1022.4	992.64	906.77	773.09	604.45	412.6	272.88	286.38	439.31	650.42	853.9	1023.79	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	446.25	362.15	311.95	186.19	86.9	0	0	0	0	188.18	327.05	458.69	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2367.36	(98)
Space heating requirement in kWh/m²/year	33.5	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2367.36	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2485.72	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2034.31	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2136.02	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	46.22	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		53.22	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	53.22	(331)
Energy for lighting (calculated in Appendix L)		314.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

DER WorkSheet: New dwelling design stage

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	940.66	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	23.99	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	964.65	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				964.65	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	27.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	163.38	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1		0.52	x 0.01 =		-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1033.69	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.63	(384)
EI rating (section 14)					88.03	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:19

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.67m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 4

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.75 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.14 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 4

Address : P 2 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.67	(1a) x	2.55	(2a) =	180.21	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.67	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		180.21	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	28.1	12.56	15.54	x	0.17	=	2.64	14	217.56	(29)
Walls Type2	8.21	2.1	6.11	x	0.21	=	1.28	30	183.3	(29)
Walls Type3	2.52	0	2.52	x	0.2	=	0.51	150	378	(29)
Walls Type4	11.83	0	11.83	x	0.2	=	2.41	150	1774.5	(29)
Total area of elements, m²			50.66							(31)
Party wall			34.96	x	0	=	0	20	699.2	(32)
Party floor			70.67					70	4946.9	(32a)
Party ceiling			70.67					30	2120.1	(32b)
Internal wall **			129.75					9	1167.75	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.38 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11487.31 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 162.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.2 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 27.58 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.85	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	57.43	57.31	57.31	57.31	57.31	57.31	57.31	57.31	57.31	57.31	57.31	57.31	

Average = Sum(39)$_{1...12}$ /12= 57.32 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	

Average = Sum(40)$_{1...12}$ /12= 0.81 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.26 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.93 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	96.72	93.2	89.69	86.17	82.65	79.14	79.14	82.65	86.17	89.69	93.2	96.72	

Total = Sum(44)$_{1...12}$ = 1055.15 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	143.44	125.45	129.45	112.86	108.29	93.45	86.59	99.37	100.55	117.19	127.92	138.91	

Total = Sum(45)$_{1...12}$ = 1383.47 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.52	18.82	19.42	16.93	16.24	14.02	12.99	14.91	15.08	17.58	19.19	20.84	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.71	175.38	184.73	166.35	163.57	146.94	141.87	154.64	154.05	172.46	181.41	194.19	

Output from water heater (annual)$_{1...12}$ — 2034.31 — (64)

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

(65)m=	91.91	81.65	87.26	80.32	80.23	73.87	73.01	77.26	76.23	83.19	85.33	90.41	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	113.11	(66)

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

(67)m=	17.83	15.83	12.88	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.19	18.32	(67)

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

(68)m=	198.86	200.92	195.72	184.65	170.68	157.54	148.77	146.7	151.9	162.97	176.95	190.08	(68)

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

(69)m=	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	34.31	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	-90.49	(71)

Water heating gains (Table 5)

(72)m=	123.54	121.51	117.29	111.56	107.83	102.59	98.14	103.85	105.87	111.81	118.51	121.52	(72)

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

(73)m=	397.16	395.2	382.82	362.89	342.73	323.22	310.49	316.12	326.31	346.44	369.58	386.85	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	434.87	471.96	521.12	590.02	648.04	648.71	614.98	558.87	494.83	440.25	417.03	417.65	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.88	0.74	0.55	0.41	0.46	0.72	0.92	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.94	20.07	20.33	20.66	20.89	20.98	21	20.99	20.92	20.62	20.22	19.9	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.98	0.97	0.95	0.86	0.69	0.49	0.34	0.39	0.66	0.9	0.97	0.99	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.81	19.01	19.38	19.83	20.13	20.23	20.24	20.24	20.17	19.79	19.22	18.75	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	19.2	19.38	19.71	20.11	20.39	20.49	20.5	20.5	20.43	20.08	19.57	19.15	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.2	19.38	19.71	20.11	20.39	20.49	20.5	20.5	20.43	20.08	19.57	19.15	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.98	0.97	0.94	0.86	0.7	0.51	0.36	0.42	0.68	0.9	0.97	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	425.82	457.12	489.41	506.39	455.16	329.73	222.46	232.66	335.91	395.88	402.63	410.28	(95)

DER WorkSheet: New dwelling design stage

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	855.66	829.82	756.99	642.74	498.04	337.34	223.67	234.97	362.98	543.14	714.44	856.69	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	319.8	250.46	199.08	98.17	31.9	0	0	0	0	109.56	224.51	332.13	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1565.61 (98)

Space heating requirement in kWh/m²/year 22.15 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1565.61	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1643.89	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2034.31

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2136.02 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 37.8 (313)

Cooling System Energy Efficiency Ratio 0 (314)

Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)

Electricity for pumps and fans within dwelling (Table 4f):

mechanical ventilation - balanced, extract or positive input from outside 53.22 (330a)

warm air heating system fans 0 (330b)

pump for solar water heating 0 (330g)

Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 53.22 (331)

Energy for lighting (calculated in Appendix L) 314.81 (332)

Electricity generated by PVs (Appendix M) (negative quantity) -235 (333)

Electricity generated by wind turbine (Appendix M) (negative quantity) 0 (334)

DER WorkSheet: New dwelling design stage

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	769.32	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	19.62	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	788.94	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				788.94	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	27.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	163.38	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				857.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.14	(384)
EI rating (section 14)					90.06	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:57

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.04m²
Site Reference : 217 High Street ASHP **Plot Reference:** P 2 8 GF
Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London
Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.08 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	10.64m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 8 GF

Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.04 (1a)	x	2.55 (2a)	=	155.65	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.04 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	155.65	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Floor			61.04	x	0.12	=	7.3248	75	4578	(28)
Walls Type1	24.58	10.64	13.94	x	0.17	=	2.37	14	195.16	(29)
Walls Type2	13.97	2.1	11.87	x	0.21	=	2.48	30	356.1	(29)
Walls Type3	17.54	0	17.54	x	0.2	=	3.58	150	2631	(29)
Total area of elements, m²			117.13							(31)
Party wall			33.18	x	0	=	0	20	663.6	(32)
Party ceiling			61.04					30	1831.2	(32b)
Internal wall **			112.07					9	1008.63	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 31.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11263.69 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 184.53 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.52 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 38.61 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	25.78	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	64.4	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	64.3	

Average = Sum(39)$_{1...12}$ /12= 64.3 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.01 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.96 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	90.15	86.88	83.6	80.32	77.04	73.76	73.76	77.04	80.32	83.6	86.88	90.15	

Total = Sum(44)$_{1...12}$ = 983.5 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.7	116.93	120.66	105.2	100.94	87.1	80.71	92.62	93.73	109.23	119.23	129.48	

Total = Sum(45)$_{1...12}$ = 1289.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.05	17.54	18.1	15.78	15.14	13.07	12.11	13.89	14.06	16.38	17.88	19.42	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	

Output from water heater (annual)$_{1...12}$ | 1940.37 | (64)

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

(65)m=	88.68	78.82	84.34	77.77	77.78	71.76	71.06	75.02	73.96	80.54	82.44	87.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	(66)

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

(67)m=	15.77	14.01	11.39	8.62	6.45	5.44	5.88	7.64	10.26	13.03	15.2	16.21	(67)

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

(68)m=	175.56	177.38	172.79	163.02	150.68	139.09	131.34	129.52	134.11	143.88	156.22	167.82	(68)

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

(69)m=	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	(71)

Water heating gains (Table 5)

(72)m=	119.19	117.29	113.36	108.02	104.55	99.66	95.51	100.83	102.72	108.25	114.5	117.3	(72)

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

(73)m=	363.68	361.85	350.71	332.82	314.84	297.35	285.89	291.16	300.25	318.32	339.09	354.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	10.64	x	36.79		0.48	x	0.8	=	104.18	(79)
Southwest$_{0.9x}$	0.77	x	10.64	x	62.67		0.48	x	0.8	=	177.46	(79)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	10.64	x	85.75		0.48	x	0.8	=	242.8		(79)
Southwest	0.9x	0.77	x	10.64	x	106.25		0.48	x	0.8	=	300.84		(79)
Southwest	0.9x	0.77	x	10.64	x	119.01		0.48	x	0.8	=	336.97		(79)
Southwest	0.9x	0.77	x	10.64	x	118.15		0.48	x	0.8	=	334.53		(79)
Southwest	0.9x	0.77	x	10.64	x	113.91		0.48	x	0.8	=	322.53		(79)
Southwest	0.9x	0.77	x	10.64	x	104.39		0.48	x	0.8	=	295.57		(79)
Southwest	0.9x	0.77	x	10.64	x	92.85		0.48	x	0.8	=	262.9		(79)
Southwest	0.9x	0.77	x	10.64	x	69.27		0.48	x	0.8	=	196.13		(79)
Southwest	0.9x	0.77	x	10.64	x	44.07		0.48	x	0.8	=	124.78		(79)
Southwest	0.9x	0.77	x	10.64	x	31.49		0.48	x	0.8	=	89.16		(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	467.86	539.3	593.51	633.67	651.81	631.89	608.42	586.73	563.16	514.45	463.87	443.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.88	0.77	0.61	0.46	0.49	0.7	0.9	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.78	19.98	20.26	20.57	20.81	20.95	20.99	20.98	20.9	20.59	20.12	19.72	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.98	0.96	0.93	0.86	0.72	0.53	0.36	0.39	0.63	0.87	0.96	0.98	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.42	18.72	19.11	19.53	19.85	20	20.03	20.03	19.96	19.58	18.92	18.35	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	18.94	19.2	19.54	19.92	20.21	20.36	20.39	20.39	20.32	19.96	19.37	18.87	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	18.94	19.2	19.54	19.92	20.21	20.36	20.39	20.39	20.32	19.96	19.37	18.87	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.97	0.95	0.92	0.85	0.73	0.56	0.4	0.43	0.65	0.87	0.95	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	455.44	514.6	545.71	539.68	477.71	353.35	240.88	252.2	367.26	445.97	442.49	433.88	(95)

Monthly average external temperature from Table 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	942.5	919.12	838.6	708.7	547.41	370.23	243.93	256.57	399.71	601.72	788.94	943.03

(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	362.37	271.84	217.91	121.69	51.86	0	0	0	0	115.87	249.45	378.8

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1769.8 (98)

Space heating requirement in kWh/m²/year 28.99 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1769.8	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1858.29	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 1940.37

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2037.38 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 38.96 (313)

Cooling System Energy Efficiency Ratio 0 (314)

Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)

Electricity for pumps and fans within dwelling (Table 4f):

mechanical ventilation - balanced, extract or positive input from outside 45.96 (330a)

warm air heating system fans 0 (330b)

pump for solar water heating 0 (330g)

Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 45.96 (331)

Energy for lighting (calculated in Appendix L) 278.47 (332)

Electricity generated by PVs (Appendix M) (negative quantity) -235 (333)

Electricity generated by wind turbine (Appendix M) (negative quantity) 0 (334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	792.88	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	20.22	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	813.1	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			813.1	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	23.86	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	144.53	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			859.52	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.08	(384)
EI rating (section 14)				89.14	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:40

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.04m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 8 TF

Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	29.45 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.62 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 8 TF

Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.04 (1a)	x	2.55 (2a)	=	155.65	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.04 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	155.65	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	24.58	10.64	13.94	x	0.17	=	2.37	14	195.16	(29)
Walls Type2	13.97	2.1	11.87	x	0.21	=	2.48	30	356.1	(29)
Walls Type3	17.54	0	17.54	x	0.2	=	3.58	150	2631	(29)
Roof	61.04	0	61.04	x	0.13	=	7.94	9	549.36	(30)
Total area of elements, m²			117.13							(31)
Party wall			33.18	x	0	=	0	20	663.6	(32)
Party floor			61.04					70	4272.8	(32a)
Internal wall **			112.07					9	1008.63	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 31.7 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9676.65 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 158.53 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.72 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.42 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	25.78	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.21	67.11	67.11	67.11	67.11	67.11	67.11	67.11	67.11	67.11	67.11	67.11	

Average = Sum(39)$_{1...12}$ /12= 67.11 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	

Average = Sum(40)$_{1...12}$ /12= 1.1 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.01 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.96 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	90.15	86.88	83.6	80.32	77.04	73.76	73.76	77.04	80.32	83.6	86.88	90.15	

Total = Sum(44)$_{1...12}$ = 983.5 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.7	116.93	120.66	105.2	100.94	87.1	80.71	92.62	93.73	109.23	119.23	129.48	

Total = Sum(45)$_{1...12}$ = 1289.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.05	17.54	18.1	15.78	15.14	13.07	12.11	13.89	14.06	16.38	17.88	19.42	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	

Output from water heater (annual)$_{1...12}$ | 1940.37 | (64)

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

(65)m=	88.68	78.82	84.34	77.77	77.78	71.76	71.06	75.02	73.96	80.54	82.44	87.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	(66)

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

(67)m=	15.77	14.01	11.39	8.62	6.45	5.44	5.88	7.64	10.26	13.03	15.2	16.21	(67)

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

(68)m=	175.56	177.38	172.79	163.02	150.68	139.09	131.34	129.52	134.11	143.88	156.22	167.82	(68)

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

(69)m=	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	(71)

Water heating gains (Table 5)

(72)m=	119.19	117.29	113.36	108.02	104.55	99.66	95.51	100.83	102.72	108.25	114.5	117.3	(72)

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

(73)m=	363.68	361.85	350.71	332.82	314.84	297.35	285.89	291.16	300.25	318.32	339.09	354.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	10.64	x	36.79		0.48	x	0.8	=	104.18	(79)
Southwest$_{0.9x}$	0.77	x	10.64	x	62.67		0.48	x	0.8	=	177.46	(79)

DER WorkSheet: New dwelling design stage

Southwest 0.9x	0.77	x	10.64	x	85.75		0.48	x	0.8	=	242.8	(79)
Southwest 0.9x	0.77	x	10.64	x	106.25		0.48	x	0.8	=	300.84	(79)
Southwest 0.9x	0.77	x	10.64	x	119.01		0.48	x	0.8	=	336.97	(79)
Southwest 0.9x	0.77	x	10.64	x	118.15		0.48	x	0.8	=	334.53	(79)
Southwest 0.9x	0.77	x	10.64	x	113.91		0.48	x	0.8	=	322.53	(79)
Southwest 0.9x	0.77	x	10.64	x	104.39		0.48	x	0.8	=	295.57	(79)
Southwest 0.9x	0.77	x	10.64	x	92.85		0.48	x	0.8	=	262.9	(79)
Southwest 0.9x	0.77	x	10.64	x	69.27		0.48	x	0.8	=	196.13	(79)
Southwest 0.9x	0.77	x	10.64	x	44.07		0.48	x	0.8	=	124.78	(79)
Southwest 0.9x	0.77	x	10.64	x	31.49		0.48	x	0.8	=	89.16	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	467.86	539.3	593.51	633.67	651.81	631.89	608.42	586.73	563.16	514.45	463.87	443.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.93	0.87	0.77	0.62	0.47	0.5	0.7	0.89	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.54	19.77	20.08	20.43	20.73	20.91	20.98	20.97	20.85	20.47	19.93	19.48	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20	20	20	20	20	20	20	20	20	20	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.97	0.95	0.92	0.84	0.72	0.54	0.37	0.4	0.63	0.86	0.95	0.98	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.07	18.39	18.84	19.33	19.72	19.93	19.99	19.98	19.87	19.39	18.64	17.99	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	18.63	18.91	19.3	19.74	20.1	20.3	20.36	20.36	20.24	19.8	19.12	18.55	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	18.63	18.91	19.3	19.74	20.1	20.3	20.36	20.36	20.24	19.8	19.12	18.55	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.96	0.94	0.9	0.84	0.73	0.56	0.41	0.44	0.65	0.85	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	450.19	507	536.11	530.13	472.95	356.14	246.46	257.3	366.39	437.84	435.92	429.35	(95)

Monthly average external temperature from Table 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	962.78	940.25	859.21	727.65	563.77	382.62	252.4	265.41	412.22	617.32	806.94	962.97

(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	381.37	291.15	240.39	142.22	67.57	0	0	0	0	133.53	267.13	397.02

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1920.38 (98)

Space heating requirement in kWh/m²/year 31.46 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		1920.38	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2016.4	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 1940.37

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2037.38 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 40.54 (313)

Cooling System Energy Efficiency Ratio 0 (314)

Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)

Electricity for pumps and fans within dwelling (Table 4f):

mechanical ventilation - balanced, extract or positive input from outside 45.96 (330a)

warm air heating system fans 0 (330b)

pump for solar water heating 0 (330g)

Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 45.96 (331)

Energy for lighting (calculated in Appendix L) 278.47 (332)

Electricity generated by PVs (Appendix M) (negative quantity) -235 (333)

Electricity generated by wind turbine (Appendix M) (negative quantity) 0 (334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	825.06	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	21.04	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	846.1	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			846.1	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	23.86	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	144.53	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			892.52	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.62	(384)
EI rating (section 14)				88.72	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:10

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.04m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 2 8

Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.12 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.90 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	29.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.25 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	10.64m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 2 8

Address : P 2 8, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.04 (1a)	x	2.55 (2a)	=	155.65	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.04 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	155.65	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			10.64	x	1/[1/(1.2)+ 0.04]	=	12.18			(27)
Walls Type1	24.58	10.64	13.94	x	0.17	=	2.37	14	195.16	(29)
Walls Type2	13.97	2.1	11.87	x	0.21	=	2.48	30	356.1	(29)
Walls Type3	17.54	0	17.54	x	0.2	=	3.58	150	2631	(29)
Total area of elements, m²			56.09							(31)
Party wall			33.18	x	0	=	0	20	663.6	(32)
Party floor			61.04					70	4272.8	(32a)
Party ceiling			61.04					30	1831.2	(32b)
Internal wall **			112.07					9	1008.63	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.77 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10958.49 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 179.53 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.32 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 27.09 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	25.78	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	25.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	52.87	52.77	52.77	52.77	52.77	52.77	52.77	52.77	52.77	52.77	52.77	52.77	

Average = Sum(39)$_{1...12}$ /12= 52.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.87	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.01 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.96 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	90.15	86.88	83.6	80.32	77.04	73.76	73.76	77.04	80.32	83.6	86.88	90.15	

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

Total = Sum(44)$_{1...12}$ = 983.5 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.7	116.93	120.66	105.2	100.94	87.1	80.71	92.62	93.73	109.23	119.23	129.48	

Total = Sum(45)$_{1...12}$ = 1289.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.05	17.54	18.1	15.78	15.14	13.07	12.11	13.89	14.06	16.38	17.88	19.42	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.97	166.86	175.94	158.69	156.22	140.6	135.99	147.9	147.22	164.51	172.73	184.75	

Output from water heater (annual)$_{1...12}$ | 1940.37 | (64)

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

(65)m=	88.68	78.82	84.34	77.77	77.78	71.76	71.06	75.02	73.96	80.54	82.44	87.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	100.54	(66)

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

(67)m=	15.77	14.01	11.39	8.62	6.45	5.44	5.88	7.64	10.26	13.03	15.2	16.21	(67)

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

(68)m=	175.56	177.38	172.79	163.02	150.68	139.09	131.34	129.52	134.11	143.88	156.22	167.82	(68)

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

(69)m=	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	33.05	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	-80.44	(71)

Water heating gains (Table 5)

(72)m=	119.19	117.29	113.36	108.02	104.55	99.66	95.51	100.83	102.72	108.25	114.5	117.3	(72)

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

(73)m=	363.68	361.85	350.71	332.82	314.84	297.35	285.89	291.16	300.25	318.32	339.09	354.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	10.64	x	36.79		0.48	x	0.8	=	104.18	(79)
Southwest$_{0.9x}$	0.77	x	10.64	x	62.67		0.48	x	0.8	=	177.46	(79)

DER WorkSheet: New dwelling design stage

Southwest 0.9x	0.77	x	10.64	x	85.75		0.48	x	0.8	=	242.8	(79)
Southwest 0.9x	0.77	x	10.64	x	106.25		0.48	x	0.8	=	300.84	(79)
Southwest 0.9x	0.77	x	10.64	x	119.01		0.48	x	0.8	=	336.97	(79)
Southwest 0.9x	0.77	x	10.64	x	118.15		0.48	x	0.8	=	334.53	(79)
Southwest 0.9x	0.77	x	10.64	x	113.91		0.48	x	0.8	=	322.53	(79)
Southwest 0.9x	0.77	x	10.64	x	104.39		0.48	x	0.8	=	295.57	(79)
Southwest 0.9x	0.77	x	10.64	x	92.85		0.48	x	0.8	=	262.9	(79)
Southwest 0.9x	0.77	x	10.64	x	69.27		0.48	x	0.8	=	196.13	(79)
Southwest 0.9x	0.77	x	10.64	x	44.07		0.48	x	0.8	=	124.78	(79)
Southwest 0.9x	0.77	x	10.64	x	31.49		0.48	x	0.8	=	89.16	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	104.18	177.46	242.8	300.84	336.97	334.53	322.53	295.57	262.9	196.13	124.78	89.16	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	467.86	539.3	593.51	633.67	651.81	631.89	608.42	586.73	563.16	514.45	463.87	443.64	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.83	0.69	0.52	0.38	0.41	0.62	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.1	20.29	20.53	20.76	20.92	20.98	21	21	20.96	20.77	20.39	20.04	(87)

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

(88)m=	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.8	0.65	0.46	0.31	0.34	0.55	0.82	0.95	0.98	(89)

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

(90)m=	19	19.28	19.61	19.93	20.12	20.19	20.2	20.2	20.17	19.94	19.42	18.92	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.41	19.66	19.96	20.24	20.42	20.49	20.5	20.5	20.47	20.25	19.78	19.35	(92)

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

(93)m=	19.41	19.66	19.96	20.24	20.42	20.49	20.5	20.5	20.47	20.25	19.78	19.35	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.97	0.94	0.89	0.8	0.66	0.48	0.34	0.37	0.58	0.82	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	452.64	507.68	530.6	509.75	431.37	305.49	205.01	215.14	324.39	424.29	436.56	431.88	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	799.09	778.91	710.12	598.51	460.17	310.63	205.72	216.23	336.07	509.32	669.2	799.25	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	257.76	182.27	133.56	63.91	21.43	0	0	0	0	63.26	167.5	273.33	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1163	(98)
Space heating requirement in kWh/m²/year	19.05	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1163	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1221.15	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1940.37	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2037.38	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.59	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		45.96	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	45.96	(331)
Energy for lighting (calculated in Appendix L)		278.47	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

	Energy kWh/year	**Emission factor kg CO2/kWh**	**Emissions kg CO2/year**

DER WorkSheet: New dwelling design stage

CO2 from other sources of space and water heating (not CHP)					
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel			255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	663.21	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.91	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	680.12	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			680.12	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	23.86	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	144.53	(379)
Energy saving/generation technologies (333) to (334) as applicable					
Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			726.54	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.9	(384)
EI rating (section 14)				90.82	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:49:02

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 82.88m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 3 2

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	20.52 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.94 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	33.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	28.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	14.3m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 3 2

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	82.88	(1a) x	2.55	(2a) =	211.34	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	82.88	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		211.34	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			14.3	x	1/[1/(1.2)+ 0.04]	=	16.37			(27)
Walls Type1	33.63	14.3	19.33	x	0.17	=	3.29	14	270.62	(29)
Walls Type2	30.14	2.1	28.04	x	0.21	=	5.87	30	841.2	(29)
Total area of elements, m²			63.77							(31)
Party wall			35.24	x	0	=	0	20	704.8	(32)
Party floor			82.88					70	5801.6	(32a)
Party ceiling			82.88					30	2486.4	(32b)
Internal wall **			152.17					9	1369.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.68 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11474.15 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 138.44 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.85 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 32.52 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	35.01	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.53	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	

Average = Sum(39)$_{1...12}$ /12= 67.41 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81

Average = Sum(40)$_{1...12}$ /12= 0.81 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.52 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 93.94 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	103.33	99.57	95.82	92.06	88.3	84.54	84.54	88.3	92.06	95.82	99.57	103.33

Total = Sum(44)$_{1...12}$ = 1127.24 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	153.24	134.02	138.3	120.57	115.69	99.83	92.51	106.16	107.42	125.19	136.66	148.4

Total = Sum(45)$_{1...12}$ = 1477.99 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.99	20.1	20.74	18.09	17.35	14.97	13.88	15.92	16.11	18.78	20.5	22.26

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	

Output from water heater (annual)$_{1...12}$ 2128.83 (64)

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

(65)m=	95.17	84.5	90.21	82.89	82.69	75.99	74.98	79.52	78.51	85.85	88.23	93.56	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	(66)

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

(67)m=	20.26	18	14.64	11.08	8.28	6.99	7.56	9.82	13.18	16.74	19.54	20.83	(67)

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

(68)m=	225.35	227.69	221.8	209.25	193.42	178.53	168.59	166.25	172.15	184.69	200.53	215.41	(68)

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

(69)m=	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	(71)

Water heating gains (Table 5)

(72)m=	127.92	125.75	121.24	115.12	111.14	105.54	100.78	106.88	109.05	115.39	122.55	125.76	(72)

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

(73)m=	434.27	432.17	418.41	396.18	373.57	351.8	337.66	343.68	355.1	377.55	403.34	422.73	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	14.3	x	36.79	x	0.48	x	0.8	=	140.02	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	62.67	x	0.48	x	0.8	=	238.5	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	85.75	x	0.48	x	0.8	=	326.32	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	106.25	x	0.48	x	0.8	=	404.33	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	119.01	x	0.48	x	0.8	=	452.88	(79)

Southwest 0.9x	0.77	x	14.3	x	118.15		0.48	x	0.8	=	449.61	(79)		
Southwest 0.9x	0.77	x	14.3	x	113.91		0.48	x	0.8	=	433.47	(79)		
Southwest 0.9x	0.77	x	14.3	x	104.39		0.48	x	0.8	=	397.25	(79)		
Southwest 0.9x	0.77	x	14.3	x	92.85		0.48	x	0.8	=	353.34	(79)		
Southwest 0.9x	0.77	x	14.3	x	69.27		0.48	x	0.8	=	263.59	(79)		
Southwest 0.9x	0.77	x	14.3	x	44.07		0.48	x	0.8	=	167.71	(79)		
Southwest 0.9x	0.77	x	14.3	x	31.49		0.48	x	0.8	=	119.82	(79)		

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	140.02	238.5	326.32	404.33	452.88	449.61	433.47	397.25	353.34	263.59	167.71	119.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	574.28	670.67	744.73	800.51	826.45	801.41	771.13	740.93	708.44	641.14	571.04	542.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.9	0.81	0.68	0.52	0.38	0.41	0.61	0.84	0.95	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.9	20.13	20.4	20.68	20.88	20.97	20.99	20.99	20.94	20.69	20.23	19.83	(87)

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

(88)m=	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	20.24	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.88	0.79	0.64	0.46	0.32	0.35	0.56	0.81	0.94	0.97	(89)

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

(90)m=	18.76	19.09	19.48	19.86	20.11	20.22	20.24	20.24	20.19	19.87	19.25	18.67	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.15	19.44	19.8	20.14	20.37	20.47	20.5	20.49	20.44	20.15	19.59	19.07	(92)

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

(93)m=	19.15	19.44	19.8	20.14	20.37	20.47	20.5	20.49	20.44	20.15	19.59	19.07	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.92	0.87	0.78	0.65	0.48	0.34	0.37	0.57	0.81	0.93	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	548.5	619.65	649.82	626.94	535.79	384.91	260.67	273.1	405.11	517.8	528.6	522.23	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1002.87	980.25	896.18	757.72	584.63	395.92	262.65	275.98	427.6	643.85	841.46	1002.18	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	338.06	242.32	183.29	94.16	36.33	0	0	0	0	93.78	225.26	357.09	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1570.29	(98)
Space heating requirement in kWh/m²/year		18.95	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1570.29	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1648.8	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2128.83	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2235.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.84	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		61.84	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	61.84	(331)
Energy for lighting (calculated in Appendix L)		357.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	790.52	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.16	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	810.68	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			810.68	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	32.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	185.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			906.54	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			10.94	(384)
EI rating (section 14)				90.5	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:49

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 82.88m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 3 2 GF

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	14.3m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 3 2 GF

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	82.88	(1a) x	2.55	(2a) =	211.34	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	82.88	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		211.34	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			14.3	x	1/[1/(1.2)+ 0.04]	=	16.37			(27)
Floor			82.88	x	0.12	=	9.9456	75	6216	(28)
Walls Type1	33.63	14.3	19.33	x	0.17	=	3.29	14	270.62	(29)
Walls Type2	30.14	2.1	28.04	x	0.21	=	5.87	30	841.2	(29)
Total area of elements, m²			146.65							(31)
Party wall			35.24	x	0	=	0	20	704.8	(32)
Party ceiling			82.88					30	2486.4	(32b)
Internal wall **			152.17					9	1369.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11888.55 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 143.44 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.51 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 47.13 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	35.01	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	82.14	82	82	82	82	82	82	82	82	82	82	82	

Average = Sum(39)$_{1...12}$ /12= 82.02 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.52 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 93.94 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	103.33	99.57	95.82	92.06	88.3	84.54	84.54	88.3	92.06	95.82	99.57	103.33

Total = Sum(44)$_{1...12}$ = 1127.24 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	153.24	134.02	138.3	120.57	115.69	99.83	92.51	106.16	107.42	125.19	136.66	148.4

Total = Sum(45)$_{1...12}$ = 1477.99 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.99	20.1	20.74	18.09	17.35	14.97	13.88	15.92	16.11	18.78	20.5	22.26

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	

Output from water heater (annual)$_{1...12}$ 2128.83 (64)

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

(65)m=	95.17	84.5	90.21	82.89	82.69	75.99	74.98	79.52	78.51	85.85	88.23	93.56	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	(66)

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

(67)m=	20.26	18	14.64	11.08	8.28	6.99	7.56	9.82	13.18	16.74	19.54	20.83	(67)

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

(68)m=	225.35	227.69	221.8	209.25	193.42	178.53	168.59	166.25	172.15	184.69	200.53	215.41	(68)

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

(69)m=	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	(71)

Water heating gains (Table 5)

(72)m=	127.92	125.75	121.24	115.12	111.14	105.54	100.78	106.88	109.05	115.39	122.55	125.76	(72)

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

(73)m=	434.27	432.17	418.41	396.18	373.57	351.8	337.66	343.68	355.1	377.55	403.34	422.73	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	14.3	x	36.79	x	0.48	x	0.8	=	140.02	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	62.67	x	0.48	x	0.8	=	238.5	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	85.75	x	0.48	x	0.8	=	326.32	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	106.25	x	0.48	x	0.8	=	404.33	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	119.01	x	0.48	x	0.8	=	452.88	(79)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	14.3	x	118.15	0.48	x	0.8	=	449.61	(79)
Southwest	0.9x	0.77	x	14.3	x	113.91	0.48	x	0.8	=	433.47	(79)
Southwest	0.9x	0.77	x	14.3	x	104.39	0.48	x	0.8	=	397.25	(79)
Southwest	0.9x	0.77	x	14.3	x	92.85	0.48	x	0.8	=	353.34	(79)
Southwest	0.9x	0.77	x	14.3	x	69.27	0.48	x	0.8	=	263.59	(79)
Southwest	0.9x	0.77	x	14.3	x	44.07	0.48	x	0.8	=	167.71	(79)
Southwest	0.9x	0.77	x	14.3	x	31.49	0.48	x	0.8	=	119.82	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	140.02	238.5	326.32	404.33	452.88	449.61	433.47	397.25	353.34	263.59	167.71	119.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	574.28	670.67	744.73	800.51	826.45	801.41	771.13	740.93	708.44	641.14	571.04	542.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.86	0.75	0.6	0.45	0.49	0.69	0.88	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.55	19.79	20.11	20.46	20.75	20.92	20.98	20.97	20.86	20.49	19.94	19.49	(87)

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

(88)m=	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.91	0.84	0.71	0.53	0.37	0.4	0.63	0.86	0.95	0.98	(89)

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

(90)m=	18.16	18.5	18.95	19.44	19.83	20.03	20.08	20.07	19.97	19.49	18.72	18.07	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.63	18.94	19.35	19.79	20.14	20.33	20.39	20.38	20.27	19.83	19.14	18.55	(92)

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

(93)m=	18.63	18.94	19.35	19.79	20.14	20.33	20.39	20.38	20.27	19.83	19.14	18.55	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.9	0.83	0.71	0.55	0.39	0.43	0.64	0.85	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	552.59	629.15	669.02	662.31	588.56	440.47	304.05	317.45	453.49	542.77	536.37	525.24	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1177.48	1151.43	1053.54	893.17	692.36	470.14	310.65	326.57	506.36	757.08	987.48	1177.14	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	464.92	350.97	286.08	166.22	77.22	0	0	0	0	159.44	324.8	485.01	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2314.68	(98)
Space heating requirement in kWh/m²/year		27.93	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2314.68	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2430.41	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2128.83	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2235.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	46.66	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		61.84	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	61.84	(331)
Energy for lighting (calculated in Appendix L)		357.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	949.6	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	24.21	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	973.82	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			973.82	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	32.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	185.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1069.67	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.91	(384)
EI rating (section 14)				88.79	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:32

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 82.88m²

Site Reference : 217 High Street ASHP **Plot Reference:** P 3 2 TF

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.34 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South West	14.3m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P 3 2 TF

Address : P 3 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	82.88 (1a)	x	2.55 (2a)	=	211.34	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	82.88 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	211.34	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			14.3	x	1/[1/(1.2)+ 0.04]	=	16.37			(27)
Walls Type1	33.63	14.3	19.33	x	0.17	=	3.29	14	270.62	(29)
Walls Type2	30.14	2.1	28.04	x	0.21	=	5.87	30	841.2	(29)
Roof	82.88	0	82.88	x	0.13	=	10.77	9	745.92	(30)
Total area of elements, m²			146.65							(31)
Party wall			35.24	x	0	=	0	20	704.8	(32)
Party floor			82.88					70	5801.6	(32a)
Internal wall **			152.17					9	1369.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 39.45 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9733.67 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 117.44 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.01 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 50.46 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	35.01	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	34.87	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	85.47	85.33	85.33	85.33	85.33	85.33	85.33	85.33	85.33	85.33	85.33	85.33	

Average = Sum(39)$_{1...12}$ /12= 85.34 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.52 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 93.94 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	103.33	99.57	95.82	92.06	88.3	84.54	84.54	88.3	92.06	95.82	99.57	103.33

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

Total = Sum(44)$_{1...12}$ = 1127.24 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	153.24	134.02	138.3	120.57	115.69	99.83	92.51	106.16	107.42	125.19	136.66	148.4

Total = Sum(45)$_{1...12}$ = 1477.99 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.99	20.1	20.74	18.09	17.35	14.97	13.88	15.92	16.11	18.78	20.5	22.26

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	208.51	183.95	193.57	174.07	170.97	153.33	147.79	161.43	160.92	180.47	190.15	203.68	

Output from water heater (annual)$_{1...12}$ 2128.83 (64)

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

(65)m=	95.17	84.5	90.21	82.89	82.69	75.99	74.98	79.52	78.51	85.85	88.23	93.56	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	125.76	(66)

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

(67)m=	20.26	18	14.64	11.08	8.28	6.99	7.56	9.82	13.18	16.74	19.54	20.83	(67)

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

(68)m=	225.35	227.69	221.8	209.25	193.42	178.53	168.59	166.25	172.15	184.69	200.53	215.41	(68)

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

(69)m=	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	-100.61	(71)

Water heating gains (Table 5)

(72)m=	127.92	125.75	121.24	115.12	111.14	105.54	100.78	106.88	109.05	115.39	122.55	125.76	(72)

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

(73)m=	434.27	432.17	418.41	396.18	373.57	351.8	337.66	343.68	355.1	377.55	403.34	422.73	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest$_{0.9x}$	0.77	x	14.3	x	36.79	x	0.48	x	0.8	=	140.02	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	62.67	x	0.48	x	0.8	=	238.5	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	85.75	x	0.48	x	0.8	=	326.32	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	106.25	x	0.48	x	0.8	=	404.33	(79)
Southwest$_{0.9x}$	0.77	x	14.3	x	119.01	x	0.48	x	0.8	=	452.88	(79)

DER WorkSheet: New dwelling design stage

Southwest 0.9x	0.77	x	14.3	x	118.15		0.48	x	0.8	=	449.61	(79)
Southwest 0.9x	0.77	x	14.3	x	113.91		0.48	x	0.8	=	433.47	(79)
Southwest 0.9x	0.77	x	14.3	x	104.39		0.48	x	0.8	=	397.25	(79)
Southwest 0.9x	0.77	x	14.3	x	92.85		0.48	x	0.8	=	353.34	(79)
Southwest 0.9x	0.77	x	14.3	x	69.27		0.48	x	0.8	=	263.59	(79)
Southwest 0.9x	0.77	x	14.3	x	44.07		0.48	x	0.8	=	167.71	(79)
Southwest 0.9x	0.77	x	14.3	x	31.49		0.48	x	0.8	=	119.82	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	140.02	238.5	326.32	404.33	452.88	449.61	433.47	397.25	353.34	263.59	167.71	119.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	574.28	670.67	744.73	800.51	826.45	801.41	771.13	740.93	708.44	641.14	571.04	542.55	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.91	0.84	0.74	0.6	0.46	0.49	0.68	0.86	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.23	19.5	19.86	20.28	20.63	20.87	20.96	20.94	20.79	20.32	19.69	19.16	(87)

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

(88)m=	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.89	0.82	0.7	0.53	0.37	0.4	0.62	0.84	0.93	0.96	(89)

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

(90)m=	17.69	18.08	18.6	19.18	19.66	19.94	20.03	20.02	19.85	19.25	18.36	17.59	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.22	18.56	19.03	19.55	19.99	20.26	20.35	20.34	20.17	19.62	18.81	18.13	(92)

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

(93)m=	18.22	18.56	19.03	19.55	19.99	20.26	20.35	20.34	20.17	19.62	18.81	18.13	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.94	0.92	0.87	0.8	0.7	0.55	0.4	0.43	0.63	0.82	0.92	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	541.79	613.87	649.98	642.5	574.54	437.46	307.43	319.73	445.64	526.39	523.43	515.82	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1189.79	1165.91	1069.16	909.04	707.46	482.71	319.87	336.04	518.38	769.73	999.65	1188.78	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	482.11	370.97	311.87	191.91	98.9	0	0	0	0	181.04	342.88	500.69	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2480.37	(98)
Space heating requirement in kWh/m²/year		29.93	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2480.37	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2604.39	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2128.83	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2235.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	48.4	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		61.84	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	61.84	(331)
Energy for lighting (calculated in Appendix L)		357.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	985.01	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.12	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	1010.13	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1010.13	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	32.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	185.73	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1105.99	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.34	(384)
EI rating (section 14)				88.41	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:12

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 39.24m²

Site Reference : 217 High Street ASHP **Plot Reference:** P S 2 GF

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	32.8 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.15 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.29 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	5.23m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P S 2 GF

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.24	(1a) x	2.55	(2a) =	100.06	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	39.24	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		100.06	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			5.23	x	1/[1/(1.2)+ 0.04]	=	5.99			(27)
Floor			39.24	x	0.12	=	4.7088	75	2943	(28)
Walls Type1	12.09	5.23	6.86	x	0.17	=	1.17	14	96.04	(29)
Walls Type2	12.09	2.1	9.99	x	0.21	=	2.09	30	299.7	(29)
Total area of elements, m²			63.42							(31)
Party wall			42.18	x	0	=	0	20	843.6	(32)
Party ceiling			39.24					30	1177.2	(32b)
Internal wall **			40.02					9	360.18	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 17.1 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5719.72 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 145.76 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.37 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 22.47 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.58	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.05	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	38.99	

Average = Sum(39)$_{1...12}$ /12= 38.99 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.39 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 67.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	73.84	71.15	68.47	65.78	63.1	60.41	60.41	63.1	65.78	68.47	71.15	73.84

Total = Sum(44)$_{1...12}$ = 805.49 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	109.5	95.77	98.82	86.16	82.67	71.34	66.1	75.86	76.76	89.46	97.65	106.04

Total = Sum(45)$_{1...12}$ = 1056.13 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.42	14.37	14.82	12.92	12.4	10.7	9.92	11.38	11.51	13.42	14.65	15.91

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	

Output from water heater (annual)$_{1...12}$ 1706.97 (64)

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

(65)m=	80.63	71.78	77.08	71.44	71.71	66.51	66.2	69.44	68.32	73.97	75.26	79.48	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	(66)

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

(67)m=	11.24	9.98	8.12	6.15	4.59	3.88	4.19	5.45	7.31	9.28	10.83	11.55	(67)

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

(68)m=	119.63	120.87	117.74	111.08	102.67	94.77	89.5	88.25	91.38	98.04	106.45	114.35	(68)

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

(69)m=	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	(71)

Water heating gains (Table 5)

(72)m=	108.37	106.82	103.6	99.23	96.38	92.38	88.98	93.34	94.89	99.42	104.53	106.83	(72)

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

(73)m=	283.03	281.47	273.25	260.25	247.45	234.83	226.46	230.83	237.37	250.54	265.61	276.52	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.23	x	11.28	x	0.48	x	0.8	=	15.7	(75)
Northeast 0.9x	0.77	x	5.23	x	22.97	x	0.48	x	0.8	=	31.96	(75)
Northeast 0.9x	0.77	x	5.23	x	41.38	x	0.48	x	0.8	=	57.59	(75)
Northeast 0.9x	0.77	x	5.23	x	67.96	x	0.48	x	0.8	=	94.58	(75)
Northeast 0.9x	0.77	x	5.23	x	91.35	x	0.48	x	0.8	=	127.13	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	5.23	x	97.38	x	0.48	x	0.8	=	135.54	(75)
Northeast 0.9x	0.77	x	5.23	x	91.1	x	0.48	x	0.8	=	126.79	(75)
Northeast 0.9x	0.77	x	5.23	x	72.63	x	0.48	x	0.8	=	101.08	(75)
Northeast 0.9x	0.77	x	5.23	x	50.42	x	0.48	x	0.8	=	70.17	(75)
Northeast 0.9x	0.77	x	5.23	x	28.07	x	0.48	x	0.8	=	39.06	(75)
Northeast 0.9x	0.77	x	5.23	x	14.2	x	0.48	x	0.8	=	19.76	(75)
Northeast 0.9x	0.77	x	5.23	x	9.21	x	0.48	x	0.8	=	12.82	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	15.7	31.96	57.59	94.58	127.13	135.54	126.79	101.08	70.17	39.06	19.76	12.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	298.73	313.43	330.84	354.82	374.58	370.36	353.25	331.91	307.55	289.6	285.37	289.35	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.94	0.88	0.77	0.61	0.47	0.51	0.73	0.9	0.95	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.65	19.78	20.05	20.41	20.73	20.92	20.98	20.97	20.84	20.46	19.99	19.61	(87)

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

(88)m=	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.95	0.93	0.86	0.73	0.54	0.38	0.42	0.67	0.87	0.94	0.97	(89)

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

(90)m=	18.29	18.49	18.87	19.37	19.8	20.02	20.08	20.07	19.94	19.45	18.8	18.23	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.42	19.56	19.85	20.23	20.57	20.76	20.82	20.81	20.68	20.28	19.79	19.37	(92)

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

(93)m=	19.42	19.56	19.85	20.23	20.57	20.76	20.82	20.81	20.68	20.28	19.79	19.37	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.95	0.92	0.86	0.76	0.6	0.45	0.5	0.71	0.88	0.94	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	286.47	297.31	305.46	306.84	282.98	220.86	159.32	164.5	218.87	254.33	268.48	278.62	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	590.31	571.54	520.37	441.81	345.84	240.28	164.61	172.05	256.63	377.54	494.69	591.49	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	226.06	184.29	159.89	97.18	46.76	0	0	0	0	91.67	162.87	232.78	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1201.5	(98)
Space heating requirement in kWh/m²/year		30.62	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1201.5	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1261.57	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1706.97	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1792.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	30.54	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		29.55	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	29.55	(331)
Energy for lighting (calculated in Appendix L)		198.46	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	621.56	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.85	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	637.41	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			637.41	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	15.34	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	103	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			633.78	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			16.15	(384)
EI rating (section 14)				89.92	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:45:58

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 39.24m²

Site Reference : 217 High Street ASHP **Plot Reference:** P S 2 TF

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	34.26 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.29 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.29 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	5.23m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P S 2 TF

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.24	(1a) x	2.55	(2a) =	100.06	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	39.24	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		100.06	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			5.23	x	1/[1/(1.2)+ 0.04]	=	5.99			(27)
Walls Type1	12.09	5.23	6.86	x	0.17	=	1.17	14	96.04	(29)
Walls Type2	12.09	2.1	9.99	x	0.21	=	2.09	30	299.7	(29)
Roof	39.24	0	39.24	x	0.13	=	5.1	9	353.16	(30)
Total area of elements, m²			63.42							(31)
Party wall			42.18	x	0	=	0	20	843.6	(32)
Party floor			39.24					70	2746.8	(32a)
Internal wall **			40.02					9	360.18	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 17.5 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4699.48 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 119.76 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.33 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 22.83 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.58	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.4	39.34	39.34	39.34	39.34	39.34	39.34	39.34	39.34	39.34	39.34	39.34	

Average = Sum(39)$_{1...12}$ /12= 39.34 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1	1	1	1	1	1	1	1	1	1	1	1

Average = Sum(40)$_{1...12}$ /12= 1 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.39 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 67.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	73.84	71.15	68.47	65.78	63.1	60.41	60.41	63.1	65.78	68.47	71.15	73.84

Total = Sum(44)$_{1...12}$ = 805.49 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	109.5	95.77	98.82	86.16	82.67	71.34	66.1	75.86	76.76	89.46	97.65	106.04

Total = Sum(45)$_{1...12}$ = 1056.13 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.42	14.37	14.82	12.92	12.4	10.7	9.92	11.38	11.51	13.42	14.65	15.91

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	

Output from water heater (annual)$_{1...12}$ 1706.97 (64)

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

(65)m=	80.63	71.78	77.08	71.44	71.71	66.51	66.2	69.44	68.32	73.97	75.26	79.48	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	(66)

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

(67)m=	11.24	9.98	8.12	6.15	4.59	3.88	4.19	5.45	7.31	9.28	10.83	11.55	(67)

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

(68)m=	119.63	120.87	117.74	111.08	102.67	94.77	89.5	88.25	91.38	98.04	106.45	114.35	(68)

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

(69)m=	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	(71)

Water heating gains (Table 5)

(72)m=	108.37	106.82	103.6	99.23	96.38	92.38	88.98	93.34	94.89	99.42	104.53	106.83	(72)

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

(73)m=	283.03	281.47	273.25	260.25	247.45	234.83	226.46	230.83	237.37	250.54	265.61	276.52	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.23	x	11.28	x	0.48	x	0.8	=	15.7	(75)
Northeast 0.9x	0.77	x	5.23	x	22.97	x	0.48	x	0.8	=	31.96	(75)
Northeast 0.9x	0.77	x	5.23	x	41.38	x	0.48	x	0.8	=	57.59	(75)
Northeast 0.9x	0.77	x	5.23	x	67.96	x	0.48	x	0.8	=	94.58	(75)
Northeast 0.9x	0.77	x	5.23	x	91.35	x	0.48	x	0.8	=	127.13	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	5.23	x	97.38	x	0.48	x	0.8	=	135.54	(75)
Northeast 0.9x	0.77	x	5.23	x	91.1	x	0.48	x	0.8	=	126.79	(75)
Northeast 0.9x	0.77	x	5.23	x	72.63	x	0.48	x	0.8	=	101.08	(75)
Northeast 0.9x	0.77	x	5.23	x	50.42	x	0.48	x	0.8	=	70.17	(75)
Northeast 0.9x	0.77	x	5.23	x	28.07	x	0.48	x	0.8	=	39.06	(75)
Northeast 0.9x	0.77	x	5.23	x	14.2	x	0.48	x	0.8	=	19.76	(75)
Northeast 0.9x	0.77	x	5.23	x	9.21	x	0.48	x	0.8	=	12.82	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	15.7	31.96	57.59	94.58	127.13	135.54	126.79	101.08	70.17	39.06	19.76	12.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	298.73	313.43	330.84	354.82	374.58	370.36	353.25	331.91	307.55	289.6	285.37	289.35	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.92	0.86	0.75	0.6	0.46	0.51	0.71	0.87	0.94	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.41	19.56	19.86	20.27	20.64	20.88	20.96	20.95	20.78	20.34	19.81	19.37	(87)

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

(88)m=	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.94	0.91	0.84	0.71	0.53	0.38	0.42	0.65	0.85	0.93	0.95	(89)

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

(90)m=	17.97	18.18	18.62	19.19	19.69	19.97	20.06	20.04	19.87	19.29	18.54	17.9	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.16	19.33	19.65	20.09	20.48	20.72	20.81	20.79	20.62	20.16	19.59	19.11	(92)

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

(93)m=	19.16	19.33	19.65	20.09	20.48	20.72	20.81	20.79	20.62	20.16	19.59	19.11	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.94	0.93	0.9	0.84	0.73	0.58	0.45	0.49	0.69	0.85	0.92	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	280.8	290.72	297.38	297.1	273.74	215.55	157.41	161.89	212.05	246.45	262.13	273.4	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	585.7	567.48	517.32	440.07	345.39	240.8	165.42	172.75	256.54	375.91	491.39	586.72	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	226.85	185.98	163.63	102.94	53.31	0	0	0	0	96.32	165.07	233.12	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1227.2	(98)
Space heating requirement in kWh/m²/year		31.27	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1227.2	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1288.57	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1706.97	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1792.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	30.81	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		29.55	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	29.55	(331)
Energy for lighting (calculated in Appendix L)		198.46	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	627.05	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.99	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	643.04	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			643.04	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	15.34	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	103	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			639.41	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			16.29	(384)
EI rating (section 14)				89.83	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:50:27

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 39.24m²

Site Reference : 217 High Street ASHP **Plot Reference:** P S 2

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	28.58 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.42 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.29 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	5.23m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: P S 2

Address : P S 2, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.24	(1a) x	2.55	(2a) =	100.06	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	39.24	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		100.06	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			5.23	x	1/[1/(1.2)+ 0.04]	=	5.99			(27)
Walls Type1	12.09	5.23	6.86	x	0.16	=	1.1	17	116.62	(29)
Walls Type2	12.09	2.1	9.99	x	0.18	=	1.75	20	199.8	(29)
Total area of elements, m²			24.18							(31)
Party wall			42.18	x	0	=	0	20	843.6	(32)
Party floor			39.24					70	2746.8	(32a)
Party ceiling			39.24					30	1177.2	(32b)
Internal wall **			40.02					9	360.18	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 11.99 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5444.2 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 138.74 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 1.98 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 13.97 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.58	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	16.51	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	30.55	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48	30.48	

Average = Sum(39)$_{1...12}$ /12= 30.48 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78

Average = Sum(40)$_{1...12}$ /12= 0.78 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.39 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 67.12 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	73.84	71.15	68.47	65.78	63.1	60.41	60.41	63.1	65.78	68.47	71.15	73.84

Total = Sum(44)$_{1...12}$ = 805.49 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	109.5	95.77	98.82	86.16	82.67	71.34	66.1	75.86	76.76	89.46	97.65	106.04

Total = Sum(45)$_{1...12}$ = 1056.13 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.42	14.37	14.82	12.92	12.4	10.7	9.92	11.38	11.51	13.42	14.65	15.91

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	164.77	145.69	154.1	139.65	137.95	124.83	121.38	131.13	130.26	144.74	151.14	161.32	

Output from water heater (annual)$_{1...12}$ 1706.97 (64)

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

(65)m=	80.63	71.78	77.08	71.44	71.71	66.51	66.2	69.44	68.32	73.97	75.26	79.48	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	69.31	(66)

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

(67)m=	11.24	9.98	8.12	6.15	4.59	3.88	4.19	5.45	7.31	9.28	10.83	11.55	(67)

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

(68)m=	119.63	120.87	117.74	111.08	102.67	94.77	89.5	88.25	91.38	98.04	106.45	114.35	(68)

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

(69)m=	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	-55.45	(71)

Water heating gains (Table 5)

(72)m=	108.37	106.82	103.6	99.23	96.38	92.38	88.98	93.34	94.89	99.42	104.53	106.83	(72)

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

(73)m=	283.03	281.47	273.25	260.25	247.45	234.83	226.46	230.83	237.37	250.54	265.61	276.52	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.23	x	11.28	x	0.48	x	0.8	=	15.7	(75)
Northeast 0.9x	0.77	x	5.23	x	22.97	x	0.48	x	0.8	=	31.96	(75)
Northeast 0.9x	0.77	x	5.23	x	41.38	x	0.48	x	0.8	=	57.59	(75)
Northeast 0.9x	0.77	x	5.23	x	67.96	x	0.48	x	0.8	=	94.58	(75)
Northeast 0.9x	0.77	x	5.23	x	91.35	x	0.48	x	0.8	=	127.13	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	5.23	x	97.38	x	0.48	x	0.8	=	135.54	(75)
Northeast 0.9x	0.77	x	5.23	x	91.1	x	0.48	x	0.8	=	126.79	(75)
Northeast 0.9x	0.77	x	5.23	x	72.63	x	0.48	x	0.8	=	101.08	(75)
Northeast 0.9x	0.77	x	5.23	x	50.42	x	0.48	x	0.8	=	70.17	(75)
Northeast 0.9x	0.77	x	5.23	x	28.07	x	0.48	x	0.8	=	39.06	(75)
Northeast 0.9x	0.77	x	5.23	x	14.2	x	0.48	x	0.8	=	19.76	(75)
Northeast 0.9x	0.77	x	5.23	x	9.21	x	0.48	x	0.8	=	12.82	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	15.7	31.96	57.59	94.58	127.13	135.54	126.79	101.08	70.17	39.06	19.76	12.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	298.73	313.43	330.84	354.82	374.58	370.36	353.25	331.91	307.55	289.6	285.37	289.35	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.91	0.83	0.69	0.51	0.38	0.42	0.64	0.85	0.93	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.07	20.19	20.42	20.69	20.89	20.98	20.99	20.99	20.94	20.7	20.35	20.03	(87)

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

(88)m=	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.93	0.89	0.8	0.65	0.46	0.32	0.35	0.58	0.82	0.92	0.95	(89)

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

(90)m=	19.04	19.21	19.52	19.9	20.15	20.25	20.27	20.27	20.22	19.92	19.43	18.98	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.9	20.03	20.26	20.55	20.76	20.85	20.87	20.87	20.81	20.57	20.19	19.85	(92)

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

(93)m=	19.9	20.03	20.26	20.55	20.76	20.85	20.87	20.87	20.81	20.57	20.19	19.85	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.93	0.89	0.81	0.67	0.5	0.37	0.41	0.62	0.83	0.92	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	282.39	291.58	295.75	288.13	251.89	185.11	129.06	134.44	191.29	240.55	262.31	275.15	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	476.44	461.06	419.54	355.23	276.27	190.55	130.18	136.19	204.68	303.91	399.1	477.18	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	144.37	113.89	92.1	48.31	18.14	0	0	0	0	47.14	98.49	150.32	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	712.76	(98)
Space heating requirement in kWh/m²/year		18.16	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		712.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	748.4	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1706.97	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1792.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	25.41	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		29.55	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	29.55	(331)
Energy for lighting (calculated in Appendix L)		198.46	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	517.11	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	13.19	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	530.3	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			530.3	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	15.34	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	103	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			526.67	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.42	(384)
EI rating (section 14)				91.62	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:40

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 1 1 GF

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.15 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.00 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 1 1 GF

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	50.01	(1a) x	2.55	(2a) =	127.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x	1/[1/(1.2)+ 0.04]	=	10.18			(27)
Floor			50.01	x	0.12	=	6.0012	75	3750.75	(28)
Walls Type1	16.55	8.89	7.66	x	0.17	=	1.3	14	107.24	(29)
Walls Type2	16.58	2.1	14.48	x	0.21	=	3.03	30	434.4	(29)
Total area of elements, m²			83.14							(31)
Party wall			39.27	x	0	=	0	20	785.4	(32)
Party ceiling			50.01					30	1500.3	(32b)
Internal wall **			91.82					9	826.38	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7404.47 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 148.06 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.07 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 29.74 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.12	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.86	50.78	50.78	50.78	50.78	50.78	50.78	50.78	50.78	50.78	50.78	50.78	

Average = Sum(39)$_{1...12}$ /12= 50.78 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02

Average = Sum(40)$_{1...12}$ /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.69 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 74.35 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	81.78	78.81	75.83	72.86	69.89	66.91	66.91	69.89	72.86	75.83	78.81	81.78

Total = Sum(44)$_{1...12}$ = 892.16 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	121.28	106.07	109.46	95.43	91.56	79.01	73.22	84.02	85.02	99.08	108.16	117.45

Total = Sum(45)$_{1...12}$ = 1169.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	

Output from water heater (annual)$_{1...12}$ 1820.61 (64)

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

(65)m=	84.55	75.21	80.62	74.52	74.67	69.07	68.57	72.16	71.06	77.17	78.76	83.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	(66)

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

(67)m=	13.2	11.72	9.53	7.22	5.4	4.56	4.92	6.4	8.59	10.9	12.73	13.57	(67)

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

(68)m=	147.26	148.79	144.94	136.74	126.39	116.67	110.17	108.64	112.49	120.69	131.04	140.76	(68)

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

(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	(71)

Water heating gains (Table 5)

(72)m=	113.64	111.92	108.35	103.51	100.36	95.93	92.16	96.99	98.7	103.72	109.39	111.93	(72)

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

(73)m=	322.45	320.79	311.18	295.82	280.5	265.5	255.6	260.38	268.13	283.67	301.5	314.61	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)
Southeast 0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast 0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast 0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast 0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast 0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast 0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast 0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast 0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast 0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	409.5	469.06	514.05	547.18	562.05	545.01	525.08	507.34	487.8	447.54	405.76	389.11	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.9	0.83	0.71	0.56	0.41	0.45	0.64	0.85	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.69	19.92	20.22	20.54	20.8	20.94	20.98	20.98	20.89	20.57	20.07	19.63	(87)

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

(88)m=	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.89	0.8	0.67	0.49	0.33	0.36	0.58	0.81	0.93	0.96	(89)

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

(90)m=	18.34	18.67	19.08	19.53	19.86	20.02	20.06	20.06	19.98	19.58	18.88	18.26	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.89	19.17	19.54	19.94	20.24	20.39	20.43	20.43	20.35	19.98	19.36	18.81	(92)

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

(93)m=	18.89	19.17	19.54	19.94	20.24	20.39	20.43	20.43	20.35	19.98	19.36	18.81	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.87	0.8	0.68	0.51	0.36	0.39	0.6	0.81	0.92	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	387.77	431.05	449.31	435.85	379.68	279.46	191.52	200.31	291.21	362.98	372.31	371.26	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	741.96	724.65	662.21	560.4	433.47	294.07	194.67	204.61	317.22	476.32	622.62	741.93	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	263.52	197.3	158.4	89.67	40.02	0	0	0	0	84.32	180.23	275.77	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1289.24	(98)
Space heating requirement in kWh/m²/year		25.78	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1289.24	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1353.7	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1820.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1911.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.65	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		37.66	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	37.66	(331)
Energy for lighting (calculated in Appendix L)		233.12	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	664.59	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.95	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	681.54	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			681.54	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.54	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	120.99	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			700.11	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14	(384)
EI rating (section 14)				90.13	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:24

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 1 1 TF

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	29.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.42 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 1 1 TF

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	50.01	(1a) x	2.55	(2a) =	127.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x	1/[1/(1.2)+ 0.04]	=	10.18			(27)
Walls Type1	16.55	8.89	7.66	x	0.17	=	1.3	14	107.24	(29)
Walls Type2	16.58	2.1	14.48	x	0.21	=	3.03	30	434.4	(29)
Roof	50.01	0	50.01	x	0.13	=	6.5	9	450.09	(30)
Total area of elements, m²			83.14							(31)
Party wall			39.27	x	0	=	0	20	785.4	(32)
Party floor			50.01					70	3500.7	(32a)
Internal wall **			91.82					9	826.38	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.16 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6104.21 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 122.06 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.19 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.35 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.12	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	52.48	52.39	52.39	52.39	52.39	52.39	52.39	52.39	52.39	52.39	52.39	52.39	

Average = Sum(39)$_{1...12}$ /12= 52.4 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.69 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.35 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	81.78	78.81	75.83	72.86	69.89	66.91	66.91	69.89	72.86	75.83	78.81	81.78

Total = Sum(44)$_{1...12}$ = 892.16 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	121.28	106.07	109.46	95.43	91.56	79.01	73.22	84.02	85.02	99.08	108.16	117.45

Total = Sum(45)$_{1...12}$ = 1169.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	

Output from water heater (annual)$_{1...12}$ 1820.61 (64)

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

(65)m=	84.55	75.21	80.62	74.52	74.67	69.07	68.57	72.16	71.06	77.17	78.76	83.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	(66)

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

(67)m=	13.2	11.72	9.53	7.22	5.4	4.56	4.92	6.4	8.59	10.9	12.73	13.57	(67)

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

(68)m=	147.26	148.79	144.94	136.74	126.39	116.67	110.17	108.64	112.49	120.69	131.04	140.76	(68)

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

(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	(71)

Water heating gains (Table 5)

(72)m=	113.64	111.92	108.35	103.51	100.36	95.93	92.16	96.99	98.7	103.72	109.39	111.93	(72)

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

(73)m=	322.45	320.79	311.18	295.82	280.5	265.5	255.6	260.38	268.13	283.67	301.5	314.61	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)
Southeast 0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast 0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast 0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast 0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast 0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast 0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast 0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast 0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast 0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	409.5	469.06	514.05	547.18	562.05	545.01	525.08	507.34	487.8	447.54	405.76	389.11	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.95	0.92	0.88	0.81	0.7	0.56	0.42	0.45	0.64	0.83	0.92	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.41	19.66	20	20.38	20.7	20.9	20.97	20.96	20.83	20.43	19.85	19.35	(87)

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

(88)m=	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.91	0.87	0.78	0.66	0.49	0.34	0.37	0.57	0.8	0.91	0.95	(89)

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

(90)m=	17.94	18.3	18.78	19.3	19.72	19.95	20.02	20.02	19.89	19.38	18.57	17.85	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.54	18.85	19.27	19.74	20.12	20.33	20.4	20.4	20.27	19.81	19.09	18.45	(92)

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

(93)m=	18.54	18.85	19.27	19.74	20.12	20.33	20.4	20.4	20.27	19.81	19.09	18.45	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.85	0.77	0.66	0.51	0.37	0.4	0.59	0.79	0.89	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	379.23	419.86	436.25	423.18	371.43	277.95	193.42	201.69	286.97	352.26	362.58	363.61	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	747.04	730.91	669.25	567.88	440.9	300.39	199.33	209.41	323.28	482.35	627.98	746.65	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	273.65	209.03	173.35	104.18	51.69	0	0	0	0	96.79	191.09	284.98	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1384.76	(98)
Space heating requirement in kWh/m²/year		27.69	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1384.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1453.99	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1820.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1911.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.66	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		37.66	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	37.66	(331)
Energy for lighting (calculated in Appendix L)		233.12	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	685	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	17.47	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	702.47	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			702.47	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.54	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	120.99	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			721.04	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.42	(384)
EI rating (section 14)				89.83	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:54

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 1 1

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	23.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	31.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	8.89m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 1 1

Address : R 1 1 , 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	50.01	(1a) x	2.55	(2a) =	127.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	50.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			8.89	x	1/[1/(1.2)+ 0.04]	=	10.18			(27)
Walls Type1	16.55	8.89	7.66	x	0.17	=	1.3	14	107.24	(29)
Walls Type2	16.58	2.1	14.48	x	0.21	=	3.03	30	434.4	(29)
Total area of elements, m²			33.13							(31)
Party wall			39.27	x	0	=	0	20	785.4	(32)
Party floor			50.01					70	3500.7	(32a)
Party ceiling			50.01					30	1500.3	(32b)
Internal wall **			91.82					9	826.38	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 17.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7154.42 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 143.06 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 2.48 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 20.14 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.12	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	21.04	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	41.27	41.19	41.19	41.19	41.19	41.19	41.19	41.19	41.19	41.19	41.19	41.19	

Average = Sum(39)$_{1...12}$ /12= 41.19 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.83	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82

Average = Sum(40)$_{1...12}$ /12= 0.82 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.69 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.35 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	81.78	78.81	75.83	72.86	69.89	66.91	66.91	69.89	72.86	75.83	78.81	81.78

Total = Sum(44)$_{1...12}$ = 892.16 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	121.28	106.07	109.46	95.43	91.56	79.01	73.22	84.02	85.02	99.08	108.16	117.45

Total = Sum(45)$_{1...12}$ = 1169.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	176.56	156	164.73	148.92	146.84	132.51	128.49	139.29	138.52	154.36	161.65	172.73	

Output from water heater (annual)$_{1...12}$ 1820.61 (64)

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

(65)m=	84.55	75.21	80.62	74.52	74.67	69.07	68.57	72.16	71.06	77.17	78.76	83.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	84.52	(66)

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

(67)m=	13.2	11.72	9.53	7.22	5.4	4.56	4.92	6.4	8.59	10.9	12.73	13.57	(67)

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

(68)m=	147.26	148.79	144.94	136.74	126.39	116.67	110.17	108.64	112.49	120.69	131.04	140.76	(68)

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

(69)m=	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	-67.62	(71)

Water heating gains (Table 5)

(72)m=	113.64	111.92	108.35	103.51	100.36	95.93	92.16	96.99	98.7	103.72	109.39	111.93	(72)

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

(73)m=	322.45	320.79	311.18	295.82	280.5	265.5	255.6	260.38	268.13	283.67	301.5	314.61	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04	(77)
Southeast 0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27	(77)
Southeast 0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87	(77)
Southeast 0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36	(77)
Southeast 0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51	(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48	(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96	(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66	(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87	(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26	(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.04	148.27	202.87	251.36	281.55	279.51	269.48	246.96	219.66	163.87	104.26	74.49	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	409.5	469.06	514.05	547.18	562.05	545.01	525.08	507.34	487.8	447.54	405.76	389.11	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.95	0.92	0.86	0.77	0.63	0.47	0.34	0.37	0.56	0.79	0.92	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.07	20.28	20.52	20.76	20.91	20.98	21	20.99	20.96	20.77	20.38	20.01	(87)

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

(88)m=	20.23	20.23	20.23	20.23	20.23	20.23	20.23	20.23	20.23	20.23	20.23	20.23	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.91	0.84	0.74	0.59	0.42	0.28	0.31	0.5	0.76	0.9	0.95	(89)

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

(90)m=	18.99	19.29	19.63	19.95	20.14	20.22	20.23	20.23	20.2	19.97	19.44	18.91	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.43	19.69	19.99	20.27	20.45	20.52	20.54	20.54	20.5	20.29	19.82	19.35	(92)

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

(93)m=	19.43	19.69	19.99	20.27	20.45	20.52	20.54	20.54	20.5	20.29	19.82	19.35	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.84	0.74	0.6	0.44	0.31	0.33	0.52	0.76	0.9	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	382.64	420.89	430.98	405.43	338.45	239.37	161.44	169.27	254.33	339.86	363.43	367.26	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	624.27	609.08	555.67	468.48	360.49	243.98	162.23	170.41	263.78	399.09	523.75	624.07	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	179.77	126.46	92.77	45.4	16.4	0	0	0	0	44.07	115.43	191.06	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	811.36	(98)
Space heating requirement in kWh/m²/year		16.22	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		811.36	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	851.93	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		1820.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1911.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	27.64	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		37.66	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	37.66	(331)
Energy for lighting (calculated in Appendix L)		233.12	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	562.47	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	14.34	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	576.81	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			576.81	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	19.54	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	120.99	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			595.38	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.91	(384)
EI rating (section 14)				91.6	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:32

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 2 13 GF

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	28.08 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.67 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	12.56m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 2 13 GF

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.01	(1a) x	2.55	(2a) =	178.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x	1/[1/(1.2)+ 0.04]	=	14.38			(27)
Floor			70.01	x	0.12	=	8.4012	75	5250.75	(28)
Walls Type1	28.46	12.56	15.9	x	0.17	=	2.7	14	222.6	(29)
Walls Type2	28.46	2.1	26.36	x	0.21	=	5.52	30	790.8	(29)
Total area of elements, m²			126.93							(31)
Party wall			32.06	x	0	=	0	20	641.2	(32)
Party ceiling			70.01					30	2100.3	(32b)
Internal wall **			128.54					9	1156.86	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.15 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10162.51 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 145.16 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.38 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.53 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.57	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	71.1	70.99	70.99	70.99	70.99	70.99	70.99	70.99	70.99	70.99	70.99	70.99	

Average = Sum(39)$_{1...12}$ /12= 71 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.55 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.31	92.8	89.3	85.8	82.3	78.8	78.8	82.3	85.8	89.3	92.8	96.31

Total = Sum(44)$_{1...12}$ = 1050.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.82	124.91	128.9	112.38	107.83	93.05	86.22	98.94	100.12	116.68	127.37	138.31

Total = Sum(45)$_{1...12}$ = 1377.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.42	18.74	19.33	16.86	16.17	13.96	12.93	14.84	15.02	17.5	19.11	20.75

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	

Output from water heater (annual)$_{1...12}$ 2028.36 (64)

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

(65)m=	91.71	81.47	87.08	80.16	80.07	73.73	72.89	77.12	76.09	83.02	85.14	90.21	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	(66)

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

(67)m=	17.67	15.7	12.77	9.66	7.22	6.1	6.59	8.57	11.5	14.6	17.04	18.16	(67)

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

(68)m=	197.32	199.37	194.21	183.22	169.36	156.33	147.62	145.57	150.73	161.72	175.58	188.61	(68)

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

(69)m=	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	(71)

Water heating gains (Table 5)

(72)m=	123.26	121.24	117.04	111.33	107.63	102.41	97.97	103.65	105.67	111.58	118.26	121.25	(72)

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

(73)m=	394.95	393	380.71	360.92	340.9	321.53	308.88	314.49	324.6	344.59	367.57	384.72	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(75)
Northeast 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(75)
Northeast 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(75)
Northeast 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(75)
Northeast 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(75)
Northeast 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(75)
Northeast 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(75)
Northeast 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(75)
Northeast 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(75)
Northeast 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(75)
Northeast 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	432.67	469.77	519.01	588.05	646.22	647.02	613.37	557.23	493.12	438.4	415.02	415.52	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.98	0.96	0.9	0.79	0.63	0.49	0.55	0.78	0.93	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.41	19.57	19.89	20.32	20.69	20.9	20.97	20.96	20.78	20.31	19.79	19.37	(87)

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

(88)m=	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.95	0.88	0.75	0.56	0.39	0.45	0.72	0.92	0.97	0.98	(89)

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

(90)m=	17.94	18.18	18.63	19.24	19.74	19.99	20.06	20.04	19.86	19.24	18.49	17.88	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.63	18.83	19.22	19.74	20.18	20.41	20.48	20.47	20.29	19.74	19.09	18.57	(92)

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

(93)m=	18.63	18.83	19.22	19.74	20.18	20.41	20.48	20.47	20.29	19.74	19.09	18.57	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.97	0.96	0.94	0.88	0.76	0.59	0.44	0.49	0.74	0.91	0.96	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	421.49	452.94	487.37	515.27	488.81	379.73	267.12	275.52	363.78	397.89	399.02	406.1	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1018.64	988.61	902.79	769.51	602.1	412.77	275.48	288.76	439.49	648.91	851.25	1020.16	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	444.27	359.97	309.07	183.05	84.29	0	0	0	0	186.75	325.61	456.86	

DER WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =		2349.87	(98)
Space heating requirement in kWh/m²/year		33.56	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2349.87	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2467.36	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2028.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2129.78	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	45.97	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.72	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.72	(331)
Energy for lighting (calculated in Appendix L)		312.11	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	935.65	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	23.86	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	959.51	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			959.51	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.36	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.98	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1026.89	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.67	(384)
EI rating (section 14)				88.04	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:15

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 2 13 TF

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	30.75 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.07 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 2 13 TF

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.01	(1a) x	2.55	(2a) =	178.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x	1/[1/(1.2)+ 0.04]	=	14.38			(27)
Walls Type1	28.46	12.56	15.9	x	0.17	=	2.7	14	222.6	(29)
Walls Type2	28.46	2.1	26.36	x	0.21	=	5.52	30	790.8	(29)
Roof	70.01	0	70.01	x	0.13	=	9.1	9	630.09	(30)
Total area of elements, m²			126.93							(31)
Party wall			32.06	x	0	=	0	20	641.2	(32)
Party floor			70.01					70	4900.7	(32a)
Internal wall **			128.54					9	1156.86	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.85 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8342.25 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 119.16 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 44.48 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.57	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	74.06	73.94	73.94	73.94	73.94	73.94	73.94	73.94	73.94	73.94	73.94	73.94	

Average = Sum(39)$_{1...12}$ /12= 73.95 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06

Average = Sum(40)$_{1...12}$ /12= 1.06 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.55 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.31	92.8	89.3	85.8	82.3	78.8	78.8	82.3	85.8	89.3	92.8	96.31

Total = Sum(44)$_{1...12}$ = 1050.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.82	124.91	128.9	112.38	107.83	93.05	86.22	98.94	100.12	116.68	127.37	138.31

Total = Sum(45)$_{1...12}$ = 1377.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.42	18.74	19.33	16.86	16.17	13.96	12.93	14.84	15.02	17.5	19.11	20.75

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	

Output from water heater (annual)$_{1...12}$ 2028.36 (64)

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

(65)m=	91.71	81.47	87.08	80.16	80.07	73.73	72.89	77.12	76.09	83.02	85.14	90.21	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	(66)

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

(67)m=	17.67	15.7	12.77	9.66	7.22	6.1	6.59	8.57	11.5	14.6	17.04	18.16	(67)

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

(68)m=	197.32	199.37	194.21	183.22	169.36	156.33	147.62	145.57	150.73	161.72	175.58	188.61	(68)

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

(69)m=	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	(71)

Water heating gains (Table 5)

(72)m=	123.26	121.24	117.04	111.33	107.63	102.41	97.97	103.65	105.67	111.58	118.26	121.25	(72)

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

(73)m=	394.95	393	380.71	360.92	340.9	321.53	308.88	314.49	324.6	344.59	367.57	384.72	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(75)
Northeast 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(75)
Northeast 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(75)
Northeast 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(75)
Northeast 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(75)
Northeast 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(75)
Northeast 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(75)
Northeast 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(75)
Northeast 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(75)
Northeast 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(75)
Northeast 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	432.67	469.77	519.01	588.05	646.22	647.02	613.37	557.23	493.12	438.4	415.02	415.52	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.94	0.89	0.78	0.63	0.49	0.55	0.77	0.92	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.08	19.26	19.63	20.12	20.56	20.84	20.95	20.92	20.69	20.13	19.52	19.03	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.97	0.96	0.93	0.86	0.74	0.56	0.4	0.45	0.71	0.9	0.96	0.97	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	17.46	17.73	18.25	18.95	19.55	19.9	20	19.98	19.73	18.98	18.1	17.39	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	18.21	18.44	18.89	19.49	20.02	20.34	20.44	20.42	20.18	19.52	18.76	18.15	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	18.21	18.44	18.89	19.49	20.02	20.34	20.44	20.42	20.18	19.52	18.76	18.15	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.96	0.95	0.92	0.85	0.74	0.58	0.44	0.49	0.72	0.88	0.94	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	414.91	444.55	475.91	500.47	476.07	375.88	269.17	275.63	354.65	387.1	391.35	400.2	(95)

Monthly average external temperature from Table 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	1030.37	1001.2	916.07	783.21	615.41	424.06	283.92	297.17	449.24	659.39	862.22	1031.56	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m=	457.9	374.07	327.48	203.58	103.67	0	0	0	0	202.58	339.03	469.73	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2478.04	(98)
Space heating requirement in kWh/m²/year		35.4	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2478.04	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2601.94	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2028.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2129.78	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	47.32	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.72	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.72	(331)
Energy for lighting (calculated in Appendix L)		312.11	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	963.04	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	24.56	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	987.6	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			987.6	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.36	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.98	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1054.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.07	(384)
EI rating (section 14)				87.71	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:45

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.01m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 2 13

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.47 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.54 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 2 13

Address : R 2 13, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.01	(1a) x	2.55	(2a) =	178.53	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.01	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.53	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	28.46	12.56	15.9	x	0.17	=	2.7	14	222.6	(29)
Walls Type2	28.46	2.1	26.36	x	0.21	=	5.52	30	790.8	(29)
Total area of elements, m²			56.92							(31)
Party wall			32.06	x	0	=	0	20	641.2	(32)
Party floor			70.01					70	4900.7	(32a)
Party ceiling			70.01					30	2100.3	(32b)
Internal wall **			128.54					9	1156.86	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.75 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9812.46 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 140.16 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 28.97 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	29.57	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.54	58.42	58.42	58.42	58.42	58.42	58.42	58.42	58.42	58.42	58.42	58.42	

Average = Sum(39)$_{1...12}$ /12= 58.43 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.84	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Average = Sum(40)$_{1...12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.25 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.55 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	96.31	92.8	89.3	85.8	82.3	78.8	78.8	82.3	85.8	89.3	92.8	96.31

Total = Sum(44)$_{1...12}$ = 1050.61 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.82	124.91	128.9	112.38	107.83	93.05	86.22	98.94	100.12	116.68	127.37	138.31

Total = Sum(45)$_{1...12}$ = 1377.52 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.42	18.74	19.33	16.86	16.17	13.96	12.93	14.84	15.02	17.5	19.11	20.75

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	198.1	174.84	184.17	165.87	163.1	146.54	141.5	154.22	153.62	171.96	180.86	193.59	

Output from water heater (annual)$_{1...12}$ 2028.36 (64)

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

(65)m=	91.71	81.47	87.08	80.16	80.07	73.73	72.89	77.12	76.09	83.02	85.14	90.21	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	112.32	(66)

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

(67)m=	17.67	15.7	12.77	9.66	7.22	6.1	6.59	8.57	11.5	14.6	17.04	18.16	(67)

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

(68)m=	197.32	199.37	194.21	183.22	169.36	156.33	147.62	145.57	150.73	161.72	175.58	188.61	(68)

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

(69)m=	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	-89.85	(71)

Water heating gains (Table 5)

(72)m=	123.26	121.24	117.04	111.33	107.63	102.41	97.97	103.65	105.67	111.58	118.26	121.25	(72)

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

(73)m=	394.95	393	380.71	360.92	340.9	321.53	308.88	314.49	324.6	344.59	367.57	384.72	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(75)
Northeast 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(75)
Northeast 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(75)
Northeast 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(75)
Northeast 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(75)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(75)
Northeast 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(75)
Northeast 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(75)
Northeast 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(75)
Northeast 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(75)
Northeast 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(75)
Northeast 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	37.71	76.76	138.3	227.13	305.31	325.49	304.49	242.75	168.52	93.81	47.45	30.8	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	432.67	469.77	519.01	588.05	646.22	647.02	613.37	557.23	493.12	438.4	415.02	415.52	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.87	0.73	0.55	0.41	0.47	0.72	0.91	0.97	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.75	19.91	20.19	20.56	20.84	20.96	20.99	20.98	20.89	20.53	20.08	19.71	(87)

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

(88)m=	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.85	0.69	0.49	0.34	0.4	0.66	0.89	0.96	0.98	(89)

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

(90)m=	18.54	18.76	19.18	19.69	20.05	20.19	20.22	20.21	20.12	19.66	19.01	18.48	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.1	19.3	19.65	20.09	20.41	20.55	20.58	20.57	20.47	20.06	19.5	19.05	(92)

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

(93)m=	19.1	19.3	19.65	20.09	20.41	20.55	20.58	20.57	20.47	20.06	19.5	19.05	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.97	0.96	0.93	0.84	0.7	0.52	0.37	0.43	0.68	0.89	0.95	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	419.77	449.82	480.19	496.61	451.57	334.42	229.63	239.04	334.66	388.01	395.98	404.77	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	866.59	841.02	768.22	653.9	509.12	347.46	232.32	243.68	372.39	552.77	724.7	867.52	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	332.44	262.89	214.3	113.25	42.82	0	0	0	0	122.58	236.68	344.29	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1669.23	(98)
Space heating requirement in kWh/m²/year		23.84	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1669.23	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1752.7	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2028.36	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2129.78	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.82	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		52.72	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	52.72	(331)
Energy for lighting (calculated in Appendix L)		312.11	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	790.2	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.15	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	810.35	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			810.35	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	27.36	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.98	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			877.73	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.54	(384)
EI rating (section 14)				89.77	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:24

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.26m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 3 GF

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	24.03 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.90 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.38m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 3 GF

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.26 (1a)	x	2.55 (2a)	=	199.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.26 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.56	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.38	x	1/[1/(1.2)+ 0.04]	=	14.18			(27)
Floor			78.26	x	0.12	=	9.3912	75	5869.5	(28)
Walls Type1	31.08	12.38	18.7	x	0.17	=	3.18	14	261.8	(29)
Walls Type2	25.91	2.1	23.81	x	0.21	=	4.98	30	714.3	(29)
Total area of elements, m²			135.25							(31)
Party wall			34.22	x	0	=	0	20	684.4	(32)
Party ceiling			78.26					30	2347.8	(32b)
Internal wall **			143.69					9	1293.21	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11171.01 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 142.74 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.96 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	33.06	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	76.02	75.89	75.89	75.89	75.89	75.89	75.89	75.89	75.89	75.89	75.89	75.89	

Average = Sum(39)$_{1...12}$ /12= 75.9 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97

Average = Sum(40)$_{1...12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.43 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.89 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	101.08	97.4	93.73	90.05	86.38	82.7	82.7	86.38	90.05	93.73	97.4	101.08

Total = Sum(44)$_{1...12}$ = 1102.67 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	149.9	131.1	135.28	117.94	113.17	97.66	90.49	103.84	105.08	122.46	133.68	145.17

Total = Sum(45)$_{1...12}$ = 1445.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.48	19.66	20.29	17.69	16.98	14.65	13.57	15.58	15.76	18.37	20.05	21.77

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	

Output from water heater (annual)$_{1...12}$ 2096.61 (64)

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

(65)m=	94.06	83.53	89.2	82.01	81.85	75.27	74.31	78.75	77.73	84.94	87.24	92.49	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	(66)

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

(67)m=	19.63	17.44	14.18	10.74	8.03	6.78	7.32	9.52	12.77	16.22	18.93	20.18	(67)

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

(68)m=	215.77	218	212.36	200.35	185.19	170.94	161.42	159.18	164.82	176.83	191.99	206.25	(68)

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

(69)m=	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	(71)

Water heating gains (Table 5)

(72)m=	126.43	124.3	119.9	113.9	110.01	104.54	99.88	105.85	107.97	114.17	121.17	124.31	(72)

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

(73)m=	421.26	419.18	405.88	384.43	362.66	341.68	328.05	333.98	344.99	366.65	391.53	410.17	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.38	x	36.79	x	0.48	x	0.8	=	121.22	(77)
Southeast 0.9x	0.77	x	12.38	x	62.67	x	0.48	x	0.8	=	206.48	(77)
Southeast 0.9x	0.77	x	12.38	x	85.75	x	0.48	x	0.8	=	282.51	(77)
Southeast 0.9x	0.77	x	12.38	x	106.25	x	0.48	x	0.8	=	350.04	(77)
Southeast 0.9x	0.77	x	12.38	x	119.01	x	0.48	x	0.8	=	392.08	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	12.38	x	118.15	x	0.48	x	0.8	=	389.24	(77)
Southeast 0.9x	0.77	x	12.38	x	113.91	x	0.48	x	0.8	=	375.27	(77)
Southeast 0.9x	0.77	x	12.38	x	104.39	x	0.48	x	0.8	=	343.91	(77)
Southeast 0.9x	0.77	x	12.38	x	92.85	x	0.48	x	0.8	=	305.9	(77)
Southeast 0.9x	0.77	x	12.38	x	69.27	x	0.48	x	0.8	=	228.2	(77)
Southeast 0.9x	0.77	x	12.38	x	44.07	x	0.48	x	0.8	=	145.19	(77)
Southeast 0.9x	0.77	x	12.38	x	31.49	x	0.48	x	0.8	=	103.74	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	121.22	206.48	282.51	350.04	392.08	389.24	375.27	343.91	305.9	228.2	145.19	103.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.48	625.66	688.38	734.47	754.74	730.93	703.32	677.89	650.89	594.85	536.72	513.91	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.93	0.87	0.76	0.61	0.46	0.49	0.7	0.88	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.59	19.81	20.12	20.46	20.75	20.92	20.98	20.97	20.86	20.5	19.97	19.53	(87)

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

(88)m=	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.91	0.84	0.72	0.54	0.37	0.41	0.63	0.86	0.95	0.98	(89)

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

(90)m=	18.22	18.54	18.98	19.46	19.84	20.04	20.1	20.09	19.98	19.52	18.77	18.13	(90)

fLA = Living area ÷ (4) = 0.29 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.62	18.91	19.31	19.75	20.1	20.3	20.35	20.35	20.24	19.8	19.12	18.54	(92)

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

(93)m=	18.62	18.91	19.31	19.75	20.1	20.3	20.35	20.35	20.24	19.8	19.12	18.54	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.9	0.83	0.72	0.55	0.4	0.43	0.64	0.85	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	521.29	586.79	619.34	610.32	541.59	405.1	278.87	291.39	417.97	503.57	503.38	496.84	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1088.32	1063.3	972.1	823.42	637.74	432.34	284.79	299.53	465.96	698.25	912.2	1088.09	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	421.87	320.22	262.45	153.44	71.54	0	0	0	0	144.84	294.35	439.89	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2108.59	(98)
Space heating requirement in kWh/m²/year		26.94	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2108.59	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2214.02	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2096.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2201.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	44.15	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		58.39	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	58.39	(331)
Energy for lighting (calculated in Appendix L)		346.72	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	898.68	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.92	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	921.59	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			921.59	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	30.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	179.95	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1009.88	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.9	(384)
EI rating (section 14)				89.02	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:44:07

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.26m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 3 TF

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	26.31 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.32 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.38m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 3 TF

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.26 (1a)	x	2.55 (2a)	=	199.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.26 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.56	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.38	x	1/[1/(1.2)+ 0.04]	=	14.18			(27)
Walls Type1	31.08	12.38	18.7	x	0.17	=	3.18	14	261.8	(29)
Walls Type2	25.91	2.1	23.81	x	0.21	=	4.98	30	714.3	(29)
Roof	78.26	0	78.26	x	0.13	=	10.17	9	704.34	(30)
Total area of elements, m²			135.25							(31)
Party wall			34.22	x	0	=	0	20	684.4	(32)
Party floor			78.26					70	5478.2	(32a)
Internal wall **			143.69					9	1293.21	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 35.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9136.25 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 116.74 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.3 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.96 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	33.06	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	79.02	78.89	78.89	78.89	78.89	78.89	78.89	78.89	78.89	78.89	78.89	78.89	

Average = Sum(39)$_{1...12}$ /12= 78.9 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.43 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.89 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	101.08	97.4	93.73	90.05	86.38	82.7	82.7	86.38	90.05	93.73	97.4	101.08	

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

Total = Sum(44)$_{1...12}$ = 1102.67 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	149.9	131.1	135.28	117.94	113.17	97.66	90.49	103.84	105.08	122.46	133.68	145.17	

Total = Sum(45)$_{1...12}$ = 1445.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	22.48	19.66	20.29	17.69	16.98	14.65	13.57	15.58	15.76	18.37	20.05	21.77	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	

Output from water heater (annual)$_{1...12}$ 2096.61 (64)

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

(65)m=	94.06	83.53	89.2	82.01	81.85	75.27	74.31	78.75	77.73	84.94	87.24	92.49	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	(66)

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

(67)m=	19.63	17.44	14.18	10.74	8.03	6.78	7.32	9.52	12.77	16.22	18.93	20.18	(67)

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

(68)m=	215.77	218	212.36	200.35	185.19	170.94	161.42	159.18	164.82	176.83	191.99	206.25	(68)

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

(69)m=	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	(71)

Water heating gains (Table 5)

(72)m=	126.43	124.3	119.9	113.9	110.01	104.54	99.88	105.85	107.97	114.17	121.17	124.31	(72)

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

(73)m=	421.26	419.18	405.88	384.43	362.66	341.68	328.05	333.98	344.99	366.65	391.53	410.17	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.38	x	36.79	x	0.48	x	0.8	=	121.22	(77)
Southeast 0.9x	0.77	x	12.38	x	62.67	x	0.48	x	0.8	=	206.48	(77)
Southeast 0.9x	0.77	x	12.38	x	85.75	x	0.48	x	0.8	=	282.51	(77)
Southeast 0.9x	0.77	x	12.38	x	106.25	x	0.48	x	0.8	=	350.04	(77)
Southeast 0.9x	0.77	x	12.38	x	119.01	x	0.48	x	0.8	=	392.08	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	12.38	x	118.15	x	0.48	x	0.8	=	389.24	(77)
Southeast 0.9x	0.77	x	12.38	x	113.91	x	0.48	x	0.8	=	375.27	(77)
Southeast 0.9x	0.77	x	12.38	x	104.39	x	0.48	x	0.8	=	343.91	(77)
Southeast 0.9x	0.77	x	12.38	x	92.85	x	0.48	x	0.8	=	305.9	(77)
Southeast 0.9x	0.77	x	12.38	x	69.27	x	0.48	x	0.8	=	228.2	(77)
Southeast 0.9x	0.77	x	12.38	x	44.07	x	0.48	x	0.8	=	145.19	(77)
Southeast 0.9x	0.77	x	12.38	x	31.49	x	0.48	x	0.8	=	103.74	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	121.22	206.48	282.51	350.04	392.08	389.24	375.27	343.91	305.9	228.2	145.19	103.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.48	625.66	688.38	734.47	754.74	730.93	703.32	677.89	650.89	594.85	536.72	513.91	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.94	0.91	0.85	0.75	0.61	0.46	0.5	0.69	0.86	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.27	19.52	19.87	20.28	20.63	20.86	20.96	20.94	20.79	20.33	19.72	19.2	(87)

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

(88)m=	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	20.08	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.89	0.82	0.71	0.54	0.38	0.41	0.63	0.84	0.93	0.96	(89)

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

(90)m=	17.76	18.13	18.63	19.19	19.67	19.96	20.05	20.04	19.87	19.28	18.41	17.67	(90)

fLA = Living area ÷ (4) = 0.29 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.2	18.53	18.99	19.51	19.95	20.22	20.31	20.3	20.14	19.59	18.79	18.11	(92)

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

(93)m=	18.2	18.53	18.99	19.51	19.95	20.22	20.31	20.3	20.14	19.59	18.79	18.11	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.94	0.91	0.87	0.81	0.7	0.55	0.4	0.43	0.63	0.82	0.91	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	510.84	572.38	601.59	591.83	528.26	401.93	281.72	293.26	410.49	488.22	491	487.65	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1098.56	1075.49	985.38	837.06	650.86	443.37	292.89	307.86	476.48	709.16	922.48	1097.74	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	437.26	338.1	285.54	176.56	91.22	0	0	0	0	164.38	310.67	453.91	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2257.63	(98)
Space heating requirement in kWh/m²/year		28.85	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		2257.63	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2370.51	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2096.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2201.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	45.72	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		58.39	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	58.39	(331)
Energy for lighting (calculated in Appendix L)		346.72	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	930.53	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	23.73	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	954.26	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			954.26	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	30.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	179.95	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			1042.54	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			13.32	(384)
EI rating (section 14)				88.67	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:36

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.26m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 3

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	20.73 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.96 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	32.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.24 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South East	12.38m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 3

Address : R 3 3, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.26	(1a) x	2.55	(2a) =	199.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.26	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		199.56	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows			12.38	x	1/[1/(1.2)+ 0.04]	=	14.18			(27)
Walls Type1	31.08	12.38	18.7	x	0.17	=	3.18	14	261.8	(29)
Walls Type2	25.91	2.1	23.81	x	0.21	=	4.98	30	714.3	(29)
Total area of elements, m²			56.99							(31)
Party wall			34.22	x	0	=	0	20	684.4	(32)
Party floor			78.26					70	5478.2	(32a)
Party ceiling			78.26					30	2347.8	(32b)
Internal wall **			143.69					9	1293.21	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10779.71 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 137.74 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 3.78 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 29.26 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	33.06	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	32.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	62.32	62.19	62.19	62.19	62.19	62.19	62.19	62.19	62.19	62.19	62.19	62.19	

Average = Sum(39)$_{1...12}$ /12= 62.2 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.8	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79

Average = Sum(40)$_{1...12}$ /12= 0.79 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.43 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 91.89 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	101.08	97.4	93.73	90.05	86.38	82.7	82.7	86.38	90.05	93.73	97.4	101.08

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

Total = Sum(44)$_{1...12}$ = 1102.67 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	149.9	131.1	135.28	117.94	113.17	97.66	90.49	103.84	105.08	122.46	133.68	145.17

Total = Sum(45)$_{1...12}$ = 1445.77 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.48	19.66	20.29	17.69	16.98	14.65	13.57	15.58	15.76	18.37	20.05	21.77

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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)

DER WorkSheet: New dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	205.17	181.03	190.56	171.44	168.45	151.15	145.77	159.12	158.58	177.74	187.17	200.44	

Output from water heater (annual)$_{1...12}$ 2096.61 (64)

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

(65)m=	94.06	83.53	89.2	82.01	81.85	75.27	74.31	78.75	77.73	84.94	87.24	92.49	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	121.45	(66)

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

(67)m=	19.63	17.44	14.18	10.74	8.03	6.78	7.32	9.52	12.77	16.22	18.93	20.18	(67)

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

(68)m=	215.77	218	212.36	200.35	185.19	170.94	161.42	159.18	164.82	176.83	191.99	206.25	(68)

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

(69)m=	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	-97.16	(71)

Water heating gains (Table 5)

(72)m=	126.43	124.3	119.9	113.9	110.01	104.54	99.88	105.85	107.97	114.17	121.17	124.31	(72)

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

(73)m=	421.26	419.18	405.88	384.43	362.66	341.68	328.05	333.98	344.99	366.65	391.53	410.17	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	12.38	x	36.79	x	0.48	x	0.8	=	121.22	(77)
Southeast 0.9x	0.77	x	12.38	x	62.67	x	0.48	x	0.8	=	206.48	(77)
Southeast 0.9x	0.77	x	12.38	x	85.75	x	0.48	x	0.8	=	282.51	(77)
Southeast 0.9x	0.77	x	12.38	x	106.25	x	0.48	x	0.8	=	350.04	(77)
Southeast 0.9x	0.77	x	12.38	x	119.01	x	0.48	x	0.8	=	392.08	(77)

DER WorkSheet: New dwelling design stage

Southeast 0.9x	0.77	x	12.38	x	118.15	x	0.48	x	0.8	=	389.24	(77)
Southeast 0.9x	0.77	x	12.38	x	113.91	x	0.48	x	0.8	=	375.27	(77)
Southeast 0.9x	0.77	x	12.38	x	104.39	x	0.48	x	0.8	=	343.91	(77)
Southeast 0.9x	0.77	x	12.38	x	92.85	x	0.48	x	0.8	=	305.9	(77)
Southeast 0.9x	0.77	x	12.38	x	69.27	x	0.48	x	0.8	=	228.2	(77)
Southeast 0.9x	0.77	x	12.38	x	44.07	x	0.48	x	0.8	=	145.19	(77)
Southeast 0.9x	0.77	x	12.38	x	31.49	x	0.48	x	0.8	=	103.74	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	121.22	206.48	282.51	350.04	392.08	389.24	375.27	343.91	305.9	228.2	145.19	103.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.48	625.66	688.38	734.47	754.74	730.93	703.32	677.89	650.89	594.85	536.72	513.91	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.9	0.82	0.69	0.52	0.38	0.42	0.62	0.84	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.93	20.15	20.42	20.69	20.88	20.97	20.99	20.99	20.94	20.7	20.26	19.87	(87)

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

(88)m=	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.88	0.79	0.65	0.47	0.32	0.35	0.56	0.81	0.93	0.97	(89)

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

(90)m=	18.83	19.14	19.51	19.88	20.13	20.23	20.25	20.25	20.2	19.9	19.3	18.74	(90)

fLA = Living area ÷ (4) = 0.29 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.15	19.43	19.77	20.11	20.35	20.45	20.47	20.47	20.42	20.13	19.58	19.07	(92)

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

(93)m=	19.15	19.43	19.77	20.11	20.35	20.45	20.47	20.47	20.42	20.13	19.58	19.07	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

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

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.87	0.79	0.65	0.48	0.34	0.37	0.57	0.81	0.92	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	517.12	577.65	601.4	577.73	492.96	353.67	238.88	250.41	372.87	479.86	495.65	493.72	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	925.42	903.7	825.52	697.45	537.7	363.6	240.62	252.92	392.91	592.85	776.04	924.87	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	303.77	219.11	166.75	86.19	33.29	0	0	0	0	84.06	201.88	320.77	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1415.83	(98)
Space heating requirement in kWh/m²/year		18.09	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating		**kWh/year**	
Annual space heating requirement		1415.83	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1486.62	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating			
Annual water heating requirement		2096.61	
If DHW from community scheme:			
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2201.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	36.88	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		58.39	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	58.39	(331)
Energy for lighting (calculated in Appendix L)		346.72	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	**Emission factor kg CO2/kWh**		**Emissions kg CO2/year**	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	750.63	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	19.14	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	769.77	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			769.77	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	30.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	179.95	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1		0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =			858.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			10.96	(384)
EI rating (section 14)				90.67	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:28

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 98.47m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 4

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	22.1 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.79 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.99m²
Windows facing: North West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 4

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	98.47 (1a)	x	2.55 (2a)	=	251.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	98.47 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	251.1	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			4.65000009536743	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.2	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	51.1	23.55	27.55	x	0.17	=	4.68	14	385.7	(29)
Walls Type2	3.83	2.1	1.73	x	0.21	=	0.36	30	51.9	(29)
Walls Type3	14.23	0	14.23	x	0.2	=	2.9	150	2134.5	(29)
Total area of elements, m²			69.16							(31)
Party wall			41.03	x	0	=	0	20	820.6	(32)
Party floor			98.47					70	6892.9	(32a)
Party ceiling			98.47					30	2954.1	(32b)
Internal wall **			180.79					9	1627.11	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.07 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 14866.81 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 150.98 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 4.76 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.83 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	41.59	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	84.42	84.26	84.26	84.26	84.26	84.26	84.26	84.26	84.26	84.26	84.26	84.26	

Average = Sum(39)$_{1...12}$ /12= 84.27 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.72 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.92 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	108.81	104.85	100.89	96.94	92.98	89.02	89.02	92.98	96.94	100.89	104.85	108.81	

Total = Sum(44)$_{1...12}$ = 1187 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	161.36	141.13	145.63	126.96	121.82	105.12	97.41	111.78	113.12	131.83	143.9	156.27	

Total = Sum(45)$_{1...12}$ = 1556.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	24.2	21.17	21.84	19.04	18.27	15.77	14.61	16.77	16.97	19.77	21.59	23.44	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

DER WorkSheet: New dwelling design stage

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	

Output from water heater (annual)$_{1...12}$ — 2207.18 — (64)

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

(65)m=	97.87	86.87	92.64	85.01	84.73	77.75	76.61	81.39	80.41	88.05	90.64	96.18	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	(66)

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

(67)m=	22.63	20.1	16.35	12.37	9.25	7.81	8.44	10.97	14.72	18.69	21.82	23.26	(67)

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

(68)m=	253.83	256.46	249.83	235.7	217.86	201.09	189.9	187.26	193.9	208.03	225.87	242.63	(68)

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

(69)m=	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	(71)

Water heating gains (Table 5)

(72)m=	131.55	129.27	124.52	118.07	113.88	107.98	102.97	109.39	111.68	118.35	125.89	129.27	(72)

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

(73)m=	471.88	469.7	454.57	430.01	404.86	380.76	365.18	371.5	384.17	408.95	437.45	459.04	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(75)
Northeast 0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(75)
Northeast 0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(75)
Northeast 0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(75)
Northeast 0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(75)
Northeast 0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(75)
Northeast 0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(75)
Northeast 0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(75)
Northeast 0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(75)
Northeast 0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(75)
Northeast 0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(75)
Northeast 0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(75)
Northwest 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	70.71	143.93	259.32	425.87	572.46	610.3	570.93	455.15	315.98	175.9	88.97	57.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.59	613.63	713.88	855.89	977.32	991.06	936.1	826.65	700.15	584.84	526.42	516.78	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.87	0.71	0.52	0.39	0.46	0.73	0.93	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.69	19.86	20.19	20.59	20.87	20.97	20.99	20.99	20.89	20.5	20.01	19.64	(87)

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

(88)m=	20.2	20.21	20.21	20.21	20.21	20.21	20.21	20.21	20.21	20.21	20.21	20.21	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.85	0.67	0.47	0.32	0.38	0.67	0.92	0.98	0.99	(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	18.42	18.68	19.15	19.71	20.07	20.18	20.2	20.2	20.1	19.6	18.9	18.36	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.82	19.05	19.47	19.99	20.32	20.43	20.45	20.45	20.35	19.88	19.25	18.76	(92)

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

(93)m=	18.82	19.05	19.47	19.99	20.32	20.43	20.45	20.45	20.35	19.88	19.25	18.76	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.94	0.84	0.67	0.48	0.34	0.41	0.68	0.91	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	533.08	595.61	668.93	722.21	659.68	478.46	322.07	336.24	476.88	530.41	511	509.23	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1225.81	1192.56	1093.19	934.11	726.07	491.17	324.38	340.85	526.75	782.2	1023.94	1226.82	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	515.39	401.15	315.65	152.57	49.4	0	0	0	0	187.33	369.31	533.88	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2524.69 (98)

Space heating requirement in kWh/m²/year 25.64 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating **kWh/year**

Annual space heating requirement 2524.69

Space heat from Community heat pump (98) x (304a) x (305) x (306) = 2650.93 (307a)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308

Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309)

Water heating

Annual water heating requirement 2207.18

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2317.54 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 49.68 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		73.47	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	73.47	(331)
Energy for lighting (calculated in Appendix L)		399.64	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1011.23	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.79	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	1037.02	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				1037.02	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	38.13	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	207.41	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1160.59	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.79	(384)
EI rating (section 14)					89.16	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:15

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 98.47m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 4 GF

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	25.45 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.78 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.99m²
Windows facing: North West	12.56m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K

Community heating, heat from electric heat pump

Photovoltaic array

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 4 GF

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	98.47	(1a) x	2.55	(2a) =	251.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	98.47	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		251.1	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Floor			98.47	x	0.12	=	11.8164	75	7385.25	(28)
Walls Type1	51.1	23.55	27.55	x	0.17	=	4.68	14	385.7	(29)
Walls Type2	3.83	2.1	1.73	x	0.21	=	0.36	30	51.9	(29)
Walls Type3	14.23	0	14.23	x	0.2	=	2.9	150	2134.5	(29)
Total area of elements, m²			167.63							(31)
Party wall			41.03	x	0	=	0	20	820.6	(32)
Party ceiling			98.47					30	2954.1	(32b)
Internal wall **			180.79					9	1627.11	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 49.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15359.16 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 155.98 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.02 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 59.9 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	41.59	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	101.49	101.33	101.33	101.33	101.33	101.33	101.33	101.33	101.33	101.33	101.33	101.33	

Average = Sum(39)$_{1...12}$ /12= 101.34 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.72 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.92 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	108.81	104.85	100.89	96.94	92.98	89.02	89.02	92.98	96.94	100.89	104.85	108.81	

Total = Sum(44)$_{1...12}$ = 1187 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	161.36	141.13	145.63	126.96	121.82	105.12	97.41	111.78	113.12	131.83	143.9	156.27	

Total = Sum(45)$_{1...12}$ = 1556.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	24.2	21.17	21.84	19.04	18.27	15.77	14.61	16.77	16.97	19.77	21.59	23.44	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

DER WorkSheet: New dwelling design stage

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	

Output from water heater (annual)$_{1...12}$ — 2207.18 — (64)

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

(65)m=	97.87	86.87	92.64	85.01	84.73	77.75	76.61	81.39	80.41	88.05	90.64	96.18	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	(66)

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

(67)m=	22.63	20.1	16.35	12.37	9.25	7.81	8.44	10.97	14.72	18.69	21.82	23.26	(67)

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

(68)m=	253.83	256.46	249.83	235.7	217.86	201.09	189.9	187.26	193.9	208.03	225.87	242.63	(68)

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

(69)m=	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	(71)

Water heating gains (Table 5)

(72)m=	131.55	129.27	124.52	118.07	113.88	107.98	102.97	109.39	111.68	118.35	125.89	129.27	(72)

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

(73)m=	471.88	469.7	454.57	430.01	404.86	380.76	365.18	371.5	384.17	408.95	437.45	459.04	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(75)
Northeast 0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(75)
Northeast 0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(75)
Northeast 0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(75)
Northeast 0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(75)
Northeast 0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(75)
Northeast 0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(75)
Northeast 0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(75)
Northeast 0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(75)
Northeast 0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(75)
Northeast 0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(75)
Northeast 0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(75)
Northwest 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	70.71	143.93	259.32	425.87	572.46	610.3	570.93	455.15	315.98	175.9	88.97	57.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.59	613.63	713.88	855.89	977.32	991.06	936.1	826.65	700.15	584.84	526.42	516.78	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.97	0.91	0.78	0.6	0.46	0.53	0.79	0.95	0.99	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.38	19.56	19.91	20.37	20.74	20.93	20.98	20.97	20.8	20.3	19.75	19.33	(87)

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

(88)m=	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.96	0.89	0.73	0.53	0.37	0.44	0.73	0.93	0.98	0.99	(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	17.88	18.14	18.64	19.29	19.79	20	20.05	20.04	19.87	19.21	18.42	17.81	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.35	18.59	19.04	19.63	20.09	20.29	20.34	20.33	20.16	19.55	18.84	18.29	(92)

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

(93)m=	18.35	18.59	19.04	19.63	20.09	20.29	20.34	20.33	20.16	19.55	18.84	18.29	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.95	0.87	0.73	0.55	0.4	0.47	0.74	0.92	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	533.98	597.98	676.73	748.75	716.83	543.6	371.72	385	516.09	540.41	512.99	509.84	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1425.86	1386.96	1270.69	1087.44	850	576.76	379.03	398.18	614.03	907.4	1189.73	1427.66	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	663.56	530.2	441.91	243.86	99.08	0	0	0	0	273.04	487.25	682.86	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3421.75 (98)

Space heating requirement in kWh/m²/year 34.75 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating		**kWh/year**	
Annual space heating requirement		3421.75	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	3592.84	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)

Water heating

Annual water heating requirement 2207.18

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2317.54 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 59.1 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		73.47	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	73.47	(331)
Energy for lighting (calculated in Appendix L)		399.64	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1202.94	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	30.67	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	1233.61	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				1233.61	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	38.13	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	207.41	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1357.19	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.78	(384)
EI rating (section 14)					87.32	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:43:57

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 98.47m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 4 TF

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.08 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.22 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.99m²
Windows facing: North West	12.56m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 4 TF

Address : R 3 4, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	98.47	(1a) x	2.55	(2a) =	251.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	98.47	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		251.1	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			12.56	x1/[1/(1.2)+ 0.04]		=	14.38			(27)
Walls Type1	51.1	23.55	27.55	x	0.17	=	4.68	14	385.7	(29)
Walls Type2	3.83	2.1	1.73	x	0.21	=	0.36	30	51.9	(29)
Walls Type3	14.23	0	14.23	x	0.2	=	2.9	150	2134.5	(29)
Roof	98.47	0	98.47	x	0.13	=	12.8	9	886.23	(30)
Total area of elements, m²			167.63							(31)
Party wall			41.03	x	0	=	0	20	820.6	(32)
Party floor			98.47					70	6892.9	(32a)
Internal wall **			180.79					9	1627.11	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 50.87 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12798.94 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 129.98 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 12.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 63.52 (37)

DER WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	41.59	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	41.43	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	105.12	104.96	104.96	104.96	104.96	104.96	104.96	104.96	104.96	104.96	104.96	104.96	

Average = Sum(39)$_{1...12}$ /12= 104.97 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	

Average = Sum(40)$_{1...12}$ /12= 1.07 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.72 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.92 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	108.81	104.85	100.89	96.94	92.98	89.02	89.02	92.98	96.94	100.89	104.85	108.81	

Total = Sum(44)$_{1...12}$ = 1187 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	161.36	141.13	145.63	126.96	121.82	105.12	97.41	111.78	113.12	131.83	143.9	156.27	

Total = Sum(45)$_{1...12}$ = 1556.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	24.2	21.17	21.84	19.04	18.27	15.77	14.61	16.77	16.97	19.77	21.59	23.44	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

DER WorkSheet: New dwelling design stage

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	216.64	191.05	200.91	180.46	177.1	158.62	152.69	167.06	166.61	187.11	197.4	211.54	

Output from water heater (annual)$_{1...12}$ — 2207.18 — (64)

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

(65)m=	97.87	86.87	92.64	85.01	84.73	77.75	76.61	81.39	80.41	88.05	90.64	96.18	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	136.25	(66)

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

(67)m=	22.63	20.1	16.35	12.37	9.25	7.81	8.44	10.97	14.72	18.69	21.82	23.26	(67)

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

(68)m=	253.83	256.46	249.83	235.7	217.86	201.09	189.9	187.26	193.9	208.03	225.87	242.63	(68)

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

(69)m=	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	36.62	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	-109	(71)

Water heating gains (Table 5)

(72)m=	131.55	129.27	124.52	118.07	113.88	107.98	102.97	109.39	111.68	118.35	125.89	129.27	(72)

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

(73)m=	471.88	469.7	454.57	430.01	404.86	380.76	365.18	371.5	384.17	408.95	437.45	459.04	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

DER WorkSheet: New dwelling design stage

Northeast 0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(75)
Northeast 0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(75)
Northeast 0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02	(75)
Northeast 0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74	(75)
Northeast 0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15	(75)
Northeast 0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81	(75)
Northeast 0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43	(75)
Northeast 0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4	(75)
Northeast 0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46	(75)
Northeast 0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08	(75)
Northeast 0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52	(75)
Northeast 0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95	(75)
Northwest 0.9x	0.77	x	12.56	x	11.28	x	0.48	x	0.8	=	37.71	(81)
Northwest 0.9x	0.77	x	12.56	x	22.97	x	0.48	x	0.8	=	76.76	(81)
Northwest 0.9x	0.77	x	12.56	x	41.38	x	0.48	x	0.8	=	138.3	(81)
Northwest 0.9x	0.77	x	12.56	x	67.96	x	0.48	x	0.8	=	227.13	(81)
Northwest 0.9x	0.77	x	12.56	x	91.35	x	0.48	x	0.8	=	305.31	(81)
Northwest 0.9x	0.77	x	12.56	x	97.38	x	0.48	x	0.8	=	325.49	(81)
Northwest 0.9x	0.77	x	12.56	x	91.1	x	0.48	x	0.8	=	304.49	(81)
Northwest 0.9x	0.77	x	12.56	x	72.63	x	0.48	x	0.8	=	242.75	(81)
Northwest 0.9x	0.77	x	12.56	x	50.42	x	0.48	x	0.8	=	168.52	(81)
Northwest 0.9x	0.77	x	12.56	x	28.07	x	0.48	x	0.8	=	93.81	(81)
Northwest 0.9x	0.77	x	12.56	x	14.2	x	0.48	x	0.8	=	47.45	(81)
Northwest 0.9x	0.77	x	12.56	x	9.21	x	0.48	x	0.8	=	30.8	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	70.71	143.93	259.32	425.87	572.46	610.3	570.93	455.15	315.98	175.9	88.97	57.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.59	613.63	713.88	855.89	977.32	991.06	936.1	826.65	700.15	584.84	526.42	516.78	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.98	0.95	0.89	0.76	0.6	0.47	0.54	0.78	0.93	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.08	19.28	19.67	20.2	20.64	20.88	20.96	20.94	20.72	20.14	19.51	19.02	(87)

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

(88)m=	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	20.03	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.94	0.87	0.72	0.53	0.37	0.44	0.72	0.92	0.97	0.98	(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	17.44	17.74	18.31	19.05	19.64	19.93	20.01	19.99	19.75	18.98	18.08	17.37	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	17.95	18.22	18.74	19.41	19.95	20.23	20.31	20.29	20.06	19.35	18.53	17.89	(92)

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

(93)m=	17.95	18.22	18.74	19.41	19.95	20.23	20.31	20.29	20.06	19.35	18.53	17.89	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.96	0.93	0.85	0.72	0.55	0.4	0.47	0.72	0.9	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	528.13	589.38	662.9	728.81	700.75	540.87	375.59	386.2	504.16	527.6	505.6	504.8	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1435.37	1398.34	1284.18	1102.87	866.04	590.51	388.9	407.98	625.06	917.97	1199.29	1436.61	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	674.98	543.62	462.23	269.32	122.98	0	0	0	0	290.44	499.46	693.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3556.29 (98)

Space heating requirement in kWh/m²/year 36.12 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating **kWh/year**

Annual space heating requirement 3556.29

Space heat from Community heat pump (98) x (304a) x (305) x (306) = 3734.11 (307a)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308

Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309)

Water heating

Annual water heating requirement 2207.18

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2317.54 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 60.52 (313)

DER WorkSheet: New dwelling design stage

Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		73.47	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	73.47	(331)
Energy for lighting (calculated in Appendix L)		399.64	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1231.69	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	31.41	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	1263.1	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				1263.1	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	38.13	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	207.41	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)…(382) =				1386.67	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.08	(384)
EI rating (section 14)					87.05	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:46:06

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 84.06m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 5 GF

Address : R 3 5, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	25.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.45 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	High	**Fail**

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.99m²
Windows facing: South East	8.89m²
Ventilation rate:	2.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 5 GF

Address : R 3 5, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	84.06	(1a) x	2.55	(2a) =	214.35	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	84.06	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		214.35	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			8.89	x1/[1/(1.2)+ 0.04]		=	10.18			(27)
Floor			84.06	x	0.12	=	10.0872	75	6304.5	(28)
Walls Type1	49.11	19.88	29.23	x	0.17	=	4.97	14	409.22	(29)
Walls Type2	13.44	2.1	11.34	x	0.21	=	2.37	30	340.2	(29)
Total area of elements, m²			146.61							(31)
Party wall			35.6	x	0	=	0	20	712	(32)
Party ceiling			84.06					30	2521.8	(32b)
Internal wall **			154.33					9	1388.97	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 43.34 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11676.69 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 138.91 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.72 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 52.06 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	35.51	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	87.57	87.43	87.43	87.43	87.43	87.43	87.43	87.43	87.43	87.43	87.43	87.43	

Average = Sum(39)$_{1...12}$ /12= 87.44 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	

Average = Sum(40)$_{1...12}$ /12= 1.04 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.54 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 94.42 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

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

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

(44)m=	103.86	100.08	96.3	92.53	88.75	84.97	84.97	88.75	92.53	96.3	100.08	103.86	

Total = Sum(44)$_{1...12}$ = 1132.99 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	154.02	134.7	139	121.19	116.28	100.34	92.98	106.7	107.97	125.83	137.35	149.16	

Total = Sum(45)$_{1...12}$ = 1485.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.1	20.21	20.85	18.18	17.44	15.05	13.95	16	16.2	18.87	20.6	22.37	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	209.29	184.63	194.28	174.68	171.56	153.84	148.26	161.97	161.47	181.11	190.85	204.43	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	209.29	184.63	194.28	174.68	171.56	153.84	148.26	161.97	161.47	181.11	190.85	204.43	

Output from water heater (annual)$_{1...12}$ | 2136.37 | (64)

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

(65)m=	95.43	84.73	90.44	83.09	82.88	76.16	75.14	79.7	78.7	86.06	88.47	93.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	(66)

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

(67)m=	20.3	18.03	14.66	11.1	8.3	7.01	7.57	9.84	13.21	16.77	19.57	20.87	(67)

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

(68)m=	227.72	230.08	224.12	211.45	195.45	180.41	170.36	168	173.95	186.63	202.63	217.67	(68)

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

(69)m=	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	(71)

Water heating gains (Table 5)

(72)m=	128.27	126.09	121.56	115.4	111.4	105.78	100.99	107.12	109.3	115.67	122.87	126.1	(72)

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

(73)m=	437.32	435.23	421.38	398.98	376.18	354.22	339.95	345.99	357.49	380.1	406.1	425.66	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(75)
Northeast 0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02		(75)
Northeast	0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74		(75)
Northeast	0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15		(75)
Northeast	0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81		(75)
Northeast	0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43		(75)
Northeast	0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4		(75)
Northeast	0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46		(75)
Northeast	0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08		(75)
Northeast	0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52		(75)
Northeast	0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95		(75)
Southeast	0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04		(77)
Southeast	0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27		(77)
Southeast	0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87		(77)
Southeast	0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36		(77)
Southeast	0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55		(77)
Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51		(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48		(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96		(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66		(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87		(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26		(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49		(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	120.04	215.44	323.88	450.1	548.7	564.32	535.91	459.36	367.12	245.95	145.78	101.44	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	557.36	650.67	745.26	849.09	924.88	918.54	875.86	805.35	724.61	626.05	551.88	527.1	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.93	0.85	0.72	0.56	0.42	0.48	0.7	0.9	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.37	19.61	19.98	20.41	20.75	20.92	20.98	20.97	20.83	20.38	19.79	19.31	(87)

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

(88)m=	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	20.05	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.96	0.92	0.83	0.68	0.49	0.34	0.39	0.64	0.87	0.96	0.98	(89)

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

(90)m=	17.87	18.22	18.74	19.34	19.78	19.99	20.04	20.03	19.89	19.32	18.48	17.78	(90)

fLA = Living area ÷ (4) = 0.31 (91)

DER WorkSheet: New dwelling design stage

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.34	18.65	19.12	19.67	20.08	20.28	20.33	20.32	20.18	19.65	18.88	18.26	(92)

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

(93)m=	18.34	18.65	19.12	19.67	20.08	20.28	20.33	20.32	20.18	19.65	18.88	18.26	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.94	0.9	0.81	0.68	0.51	0.36	0.41	0.65	0.86	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	537.18	612.85	670.48	691.84	627.91	467.53	319.3	332.36	467.4	536.71	520.64	510.82	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1229.23	1202.26	1103.77	941.69	732.62	496.24	325.99	342.72	531.93	790.95	1030.12	1229.06	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	514.89	396.09	322.37	179.9	77.91	0	0	0	0	189.15	366.82	534.37	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2581.49 (98)

Space heating requirement in kWh/m²/year 30.71 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating **kWh/year**

Annual space heating requirement 2581.49

Space heat from Community heat pump (98) x (304a) x (305) x (306) = 2710.57 (307a)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308

Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309)

Water heating

Annual water heating requirement 2136.37

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2243.18 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 49.54 (313)

Cooling System Energy Efficiency Ratio 0 (314)

Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)

DER WorkSheet: New dwelling design stage

Electricity for pumps and fans within dwelling (Table 4f):			
mechanical ventilation - balanced, extract or positive input from outside		62.72	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	62.72	(331)
Energy for lighting (calculated in Appendix L)		358.52	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1008.23	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	25.71	(372)
Total CO2 associated with community systems	(363)...(366) + (368)...(372)			=	1033.94	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				1033.94	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	32.55	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	186.07	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)...(382) =				1130.6	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.45	(384)
EI rating (section 14)					88.26	(385)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.17
Printed on 09 July 2020 at 17:48:20

Project Information:

Assessed By: Matt Fitzpatrick (STRO003572) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 84.06m²

Site Reference : 217 High Street ASHP **Plot Reference:** R 3 5

Address : R 3 5, 217 High Street, Yiewsley, Hillingdon, TBA

Client Details:

Name: Taylor Wimpey West London

Address : Form 1, 17 Bartley Wood Business Park, Bartley Way, Hook, RG27 9XA

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	21.79 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.54 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.21 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.50 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.65 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	**OK**
Hot water controls:	No cylinder	
	No cylinder	

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power:	0.19 0.18	
Maximum	0.7	**OK**

9 Summertime temperature

Overheating risk (South England):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	10.99m²
Windows facing: South East	8.89m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours

10 Key features

Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Matt Fitzpatrick	**Stroma Number:**	STRO003572
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.4.17

Property Address: R 3 5

Address : R 3 5, 217 High Street, Yiewsley, Hillingdon, TBA

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	84.06	(1a) x	2.55	(2a) =	214.35	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	84.06	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		214.35	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				4.65000009536743 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.23 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.2 (21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1.5	=	3.15			(26)
Windows Type 1			10.99	x1/[1/(1.2)+ 0.04]		=	12.58			(27)
Windows Type 2			8.89	x1/[1/(1.2)+ 0.04]		=	10.18			(27)
Walls Type1	49.11	19.88	29.23	x	0.17	=	4.97	14	409.22	(29)
Walls Type2	13.44	2.1	11.34	x	0.21	=	2.37	30	340.2	(29)
Total area of elements, m²			62.55							(31)
Party wall			35.6	x	0	=	0	20	712	(32)
Party floor			84.06					70	5884.2	(32a)
Party ceiling			84.06					30	2521.8	(32b)
Internal wall **			154.33					9	1388.97	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.26 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11256.39 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 133.91 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 4.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.35 (37)

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

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

DER WorkSheet: New dwelling design stage

(38)m=	35.51	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	35.37	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.85	72.71	72.71	72.71	72.71	72.71	72.71	72.71	72.71	72.71	72.71	72.71	

Average = Sum(39)$_{1...12}$ /12= 72.73 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	

Average = Sum(40)$_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.54 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 94.42 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	103.86	100.08	96.3	92.53	88.75	84.97	84.97	88.75	92.53	96.3	100.08	103.86	

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

Total = Sum(44)$_{1...12}$ = 1132.99 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	154.02	134.7	139	121.19	116.28	100.34	92.98	106.7	107.97	125.83	137.35	149.16	

Total = Sum(45)$_{1...12}$ = 1485.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.1	20.21	20.85	18.18	17.44	15.05	13.95	16	16.2	18.87	20.6	22.37	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 110 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51)

If community heating see section 4.3

Volume factor from Table 2a 1.03 (52)

Temperature factor from Table 2b 0.6 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	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 calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	209.29	184.63	194.28	174.68	171.56	153.84	148.26	161.97	161.47	181.11	190.85	204.43	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	209.29	184.63	194.28	174.68	171.56	153.84	148.26	161.97	161.47	181.11	190.85	204.43	

Output from water heater (annual)$_{1...12}$ | 2136.37 | (64)

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

(65)m=	95.43	84.73	90.44	83.09	82.88	76.16	75.14	79.7	78.7	86.06	88.47	93.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	126.77	(66)

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

(67)m=	20.3	18.03	14.66	11.1	8.3	7.01	7.57	9.84	13.21	16.77	19.57	20.87	(67)

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

(68)m=	227.72	230.08	224.12	211.45	195.45	180.41	170.36	168	173.95	186.63	202.63	217.67	(68)

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

(69)m=	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	35.68	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	-101.42	(71)

Water heating gains (Table 5)

(72)m=	128.27	126.09	121.56	115.4	111.4	105.78	100.99	107.12	109.3	115.67	122.87	126.1	(72)

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

(73)m=	437.32	435.23	421.38	398.98	376.18	354.22	339.95	345.99	357.49	380.1	406.1	425.66	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	10.99	x	11.28	x	0.48	x	0.8	=	33	(75)
Northeast 0.9x	0.77	x	10.99	x	22.97	x	0.48	x	0.8	=	67.17	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	10.99	x	41.38	x	0.48	x	0.8	=	121.02		(75)
Northeast	0.9x	0.77	x	10.99	x	67.96	x	0.48	x	0.8	=	198.74		(75)
Northeast	0.9x	0.77	x	10.99	x	91.35	x	0.48	x	0.8	=	267.15		(75)
Northeast	0.9x	0.77	x	10.99	x	97.38	x	0.48	x	0.8	=	284.81		(75)
Northeast	0.9x	0.77	x	10.99	x	91.1	x	0.48	x	0.8	=	266.43		(75)
Northeast	0.9x	0.77	x	10.99	x	72.63	x	0.48	x	0.8	=	212.4		(75)
Northeast	0.9x	0.77	x	10.99	x	50.42	x	0.48	x	0.8	=	147.46		(75)
Northeast	0.9x	0.77	x	10.99	x	28.07	x	0.48	x	0.8	=	82.08		(75)
Northeast	0.9x	0.77	x	10.99	x	14.2	x	0.48	x	0.8	=	41.52		(75)
Northeast	0.9x	0.77	x	10.99	x	9.21	x	0.48	x	0.8	=	26.95		(75)
Southeast	0.9x	0.77	x	8.89	x	36.79	x	0.48	x	0.8	=	87.04		(77)
Southeast	0.9x	0.77	x	8.89	x	62.67	x	0.48	x	0.8	=	148.27		(77)
Southeast	0.9x	0.77	x	8.89	x	85.75	x	0.48	x	0.8	=	202.87		(77)
Southeast	0.9x	0.77	x	8.89	x	106.25	x	0.48	x	0.8	=	251.36		(77)
Southeast	0.9x	0.77	x	8.89	x	119.01	x	0.48	x	0.8	=	281.55		(77)
Southeast	0.9x	0.77	x	8.89	x	118.15	x	0.48	x	0.8	=	279.51		(77)
Southeast	0.9x	0.77	x	8.89	x	113.91	x	0.48	x	0.8	=	269.48		(77)
Southeast	0.9x	0.77	x	8.89	x	104.39	x	0.48	x	0.8	=	246.96		(77)
Southeast	0.9x	0.77	x	8.89	x	92.85	x	0.48	x	0.8	=	219.66		(77)
Southeast	0.9x	0.77	x	8.89	x	69.27	x	0.48	x	0.8	=	163.87		(77)
Southeast	0.9x	0.77	x	8.89	x	44.07	x	0.48	x	0.8	=	104.26		(77)
Southeast	0.9x	0.77	x	8.89	x	31.49	x	0.48	x	0.8	=	74.49		(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	120.04	215.44	323.88	450.1	548.7	564.32	535.91	459.36	367.12	245.95	145.78	101.44	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	557.36	650.67	745.26	849.09	924.88	918.54	875.86	805.35	724.61	626.05	551.88	527.1	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.91	0.81	0.66	0.49	0.36	0.41	0.63	0.86	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.7	19.94	20.27	20.63	20.87	20.97	20.99	20.99	20.91	20.58	20.07	19.64	(87)

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

(88)m=	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.89	0.78	0.61	0.43	0.3	0.34	0.57	0.84	0.95	0.97	(89)

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

(90)m=	18.46	18.79	19.26	19.75	20.06	20.17	20.19	20.19	20.12	19.7	18.98	18.37	(90)

fLA = Living area ÷ (4) = 0.31 (91)

DER WorkSheet: New dwelling design stage

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.84	19.15	19.58	20.02	20.31	20.42	20.44	20.44	20.36	19.98	19.32	18.76	(92)

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

(93)m=	18.84	19.15	19.58	20.02	20.31	20.42	20.44	20.44	20.36	19.98	19.32	18.76	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.93	0.88	0.77	0.62	0.45	0.32	0.36	0.59	0.83	0.93	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	534.22	605.96	654.79	657.86	573.31	411.3	276.94	289.71	424.12	517.73	515.1	508.64	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1059.43	1036.07	950.78	808.82	625.87	422.94	279.23	293.5	455.5	681.83	888.57	1058.85	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	390.76	289.03	220.22	108.69	39.1	0	0	0	0	122.09	268.9	409.35	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1848.14 (98)

Space heating requirement in kWh/m²/year 21.99 (99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)

Fraction of space heat from community system 1 – (301) = 1 (302)

The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.

Fraction of heat from Community heat pump 1 (303a)

Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a)

Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)

Distribution loss factor (Table 12c) for community heating system 1.05 (306)

Space heating **kWh/year**

Annual space heating requirement 1848.14

Space heat from Community heat pump (98) x (304a) x (305) x (306) = 1940.54 (307a)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308

Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309)

Water heating

Annual water heating requirement 2136.37

If DHW from community scheme:

Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2243.18 (310a)

Electricity used for heat distribution 0.01 × [(307a)…(307e) + (310a)…(310e)] = 41.84 (313)

Cooling System Energy Efficiency Ratio 0 (314)

Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)

DER WorkSheet: New dwelling design stage

Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		62.72	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	62.72	(331)
Energy for lighting (calculated in Appendix L)		358.52	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-235	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)

12b. CO2 Emissions – Community heating scheme

		Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)						
Efficiency of heat source 1 (%)	If there is CHP using two fuels repeat (363) to (366) for the second fuel				255	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	851.51	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.71	(372)
Total CO2 associated with community systems	(363)...(366) + (368)...(372)			=	873.22	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				873.22	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	32.55	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	186.07	(379)
Energy saving/generation technologies (333) to (334) as applicable						
Item 1			0.52	x 0.01 =	-121.96	(380)
Total CO2, kg/year	sum of (376)...(382) =				969.88	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.54	(384)
EI rating (section 14)					89.93	(385)