



CPL Services
energy conservation consultant



SAP Calculations

Client:

Project: Detached House, Unit 1F, The Milestone Centre
Carrickmore, 75 Quarry Road, Tyrone, BT79 9AL

Contact: CPL Energy Services
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Building Regulation Compliance

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Property Reference: SAP RATING

Issued on Date: 26.Mar.2013

Survey Reference: 001

Prop Type Ref: Detached House

Property: Detached House, Unit 1F, THe Milestone Centre, 75 Quarry Road, Carrickmore, Tyrone, BT79 9AL

SAP Rating: 113 **ACO2 Emissions (t/year):** -1.43 **DER:** -12.43 Pass **Reduction:** 138.0% **FEE:** 60.9 **ZC8:** 4.90
Environmental: 113 **AGeneral Requirements Compliance:** Pass **TER:** 32.72 **HLP:** 1.37 **Energy cost:** £ -428

CfSH Results **Version:** **ENE1 Credits:** N/A **ENE2 Credits:** N/A **ENE7 Credits:** N/A **CfSH Level:** N/A

Surveyor: Conor Loughran, Tel: 028 807 60819 **Surveyor ID:** 7181-0001

Address: Aughnagreggan Rd, Carrickmore, Tyrone, BT79 9JZ

Client: Elmhurst

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 4.04r04

SAP version: SAP 2009, **Regs Region:** Northern Ireland (NI Technical Booklet F1 2011), **Calculation Type:** New Dwelling As Designed

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

1 TER and DER

Fuel for main heating:	Electricity	
Fuel factor:	1.14 × 1.47 (electricity)	
Target Carbon Dioxide Emission Rate (TER)	32.72 kg/m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	-12.43 kg/m ²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.30 (max. 0.30)	0.30 (max. 0.70)	OK
Floor	0.22 (max. 0.25)	0.22 (max. 0.70)	OK
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.97 (max. 2.00)	3.00 (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:	8.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Heat pump with radiators or underfloor - Electric Air-to-water heat pump
Secondary heating system:	None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.31 kWh/day Permitted by DBSCG 1.58	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:	75%	
Minimum	75%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Northern Ireland):	Not significant	OK
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Based On:

Overshading:	Average
Windows facing East:	4.80 m ² , No overhang
Windows facing South:	0.72 m ² , No overhang
Windows facing West:	5.79 m ² , No overhang

Ventilation rate: 5.00
Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Photovoltaic array	

Full SAP Calculation Printout

Property Reference: SAP RATING
Survey Reference: 001

Issued on Date: 26.Mar.2013
Prop Type Ref: Detached House

Property: Detached House, Unit 1F, The Milestone Centre, 75 Quarry Road, Carrickmore, Tyrone, BT79 9AL

SAP Rating: 113 A **CO2 Emissions (t/year):** -1.43 **DER:-12.43 Pass** **Reduction:** 138.0% **FEE:** 60.9 **ZC8:** 4.90
Environmental: 113 A **General Requirements Compliance:** Pass **TER:** 32.72 **HLP:** 1.37 **Energy cost:** £ -428

CfSH Results **Version:** **ENE1 Credits:** N/A **ENE2 Credits:** N/A **ENE7 Credits:** N/A **CfSH Level:** N/A

Surveyor: Conor Loughran, Tel: 028 807 60819 **Surveyor ID:** 7181-0001

Address: Aughnagreggan Rd, Carrickmore, Tyrone, BT79 9JZ
Client: Elmhurst

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 4.04r04

SAP version: SAP 2009, Regs Region: Northern Ireland (NI Technical Booklet F1 2011), Calculation Type: New Dwelling As Designed

CALCULATION DETAILS for survey reference no '001'
SAP2009 - 9.81 input data (DesignData) -

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 SAP2009 Input Data

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FullRefNo:      001
Sap Version:    SAP 2009
Regs Region:    Northern Ireland
Region:         Northern Ireland
Calculation Type: New Build (As Designed)
DwellingOrientation: East
Property Type:  House, End-Terrace
Storeys:        2
Date Built:     2011
Sheltered Sides: 2
Sunlight Shade: Average or unknown
Measurements
  1st Storey:   20, 50, 2.4
  2nd Storey:   20, 50, 2.6
Living Area:    15 m2, fraction: 15.0%
Thermal Mass:  Simple calculation
Thermal Mass Simple: Medium
Thermal MassValue: 250
External Walls
  External Wall 1 86.8, 100, 70, , CavityWallDensePlasterAACblock, , Cavity, 0, 0.3, Calculate
Party Walls
  Party Wall 1    50, 70, , PartyWallPlasterOnDabs, , FilledWithEdge, 0, 0
External Roofs
  External Roof 1 50, 50, 9, PlasterInsulatedAtCeiling, , , 0.16
Heat Loss Floors
  Heat Loss Floor 1 50, 110, GroundFloorSlabOnGround, , GroundSolid, 0, 0.22
Description
  Opening Type 1  SAP table, Solid Door, , , , , , 3.00
  Opening Type 2  SAP table, Window, Double Low-E Soft 0.05, 16 mm, False, 0.63, Wood, 0.7, 1.80
Openings
  Opening 1       Solid Door, External Wall 1, East, , , 0, 0, 0, 1.89
  Opening 2       Window, External Wall 1, East, None, 0, , 0, 0, 0, 4.80
  Opening 3       Window, External Wall 1, West, None, 0, , 0, 0, 0, 5.79
  Opening 4       Window, External Wall 1, South, None, 0, , 0, 0, 0, 0.72
Conservatory:    None
Draught Proofing: 100
Draught Lobby:  No
Thermal Bridges
  0. Junction with, Bridge Type, Source Type, Imported, Length, Psi, Adjusted, Result, Reference
  1. External wall, E1 Steel lintel with perforated steel base plate, Table K1 - Accredited, Yes, 9.2, 0.5, 0.5, 4.60,
  2. External wall, E2 Other lintels (including other steel lintels), , No, 0, 0, , ,
  3. External wall, E3 Sill, Table K1 - Accredited, Yes, 9.2, 0.04, 0.04, 0.37,
  4. External wall, E4 Jamb, Table K1 - Accredited, Yes, 22.8, 0.05, 0.05, 1.14,
  5. External wall, E5 Ground floor, Table K1 - Accredited, Yes, 20, 0.16, 0.16, 3.20,
  6. External wall, E6 Intermediate floor within a dwelling, Table K1 - Accredited, Yes, 20, 0.07, 0.07, 1.40,
  7. External wall, E7 Intermediate floor between dwellings (in blocks of flats), , No, 0, 0, , ,
  8. External wall, E8 Balcony within a dwelling, , No, 0, 0, , ,
  9. External wall, E9 Balcony between dwellings, , No, 0, 0, , ,
  10. External wall, E10 Eaves (insulation at ceiling level), Table K1 - Accredited, No, 20, 0.06, 0.06, 1.20,
  11. External wall, E11 Eaves (insulation at rafter level), , No, 0, 0, , ,
  12. External wall, E12 Gable (insulation at ceiling level), , No, 0, 0, , ,
  13. External wall, E13 Gable (insulation at rafter level), , No, 0, 0, , ,
  14. External wall, E14 Flat roof, , No, 0, 0, , ,
  15. External wall, E15 Flat roof with parapet, , No, 0, 0, , ,
  16. External wall, E16 Corner (normal), Table K1 - Accredited, Yes, 10, 0.09, 0.09, 0.90,
  17. External wall, E17 Corner (inverted - internal area greater than external area), , No, 0, 0, , ,
  18. Party wall, E18 Party wall between dwellings, Table K1 - Accredited, Yes, 10, 0.06, 0.06, 0.60,
  19. Party wall, P1 Party wall - Ground floor, Table K1 - Accredited, No, 10, 0.08, 0.08, 0.80,
  20. Party wall, P2 Party wall - Intermediate floor within a dwelling, Table K1 - Accredited, No, 10, 0, , ,
  21. Party wall, P3 Party wall - Intermediate floor between dwellings (in blocks of flats), , No, 0, 0, , ,
  22. Party wall, P4 Party wall - Roof (insulation at ceiling level), Table K1 - Accredited, No, 10, 0.12, 0.12, 1.20,
  Party wall, P5 Party wall - Roof (insulation at rafter level), , No, 0, 0, , ,
Pressure Test:    True
Designed q50:     8
AsBuilt q50:      15
Property Tested:  False
Mechanical Ventilation: None
Chimneys MHS:    0
Chimneys SHS:   0
Chimneys Other: 0
Chimneys Total: 0
Open Flues MHS:  0
Open Flues SHS:  0
Open Flues Other: 0
Open Flues Total: 0
Intermittent Fans: 3
  
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Passive Vents:	0
Flueless Gas Fires:	0
Cooling System	None
Light Fittings:	12
LEL Fittings:	9
Percentage of LEL Fittings:	75
External Lights Fitted:	No
External LELs Fitted:	No
Electricity Tariff:	Standard
Main Heating 1	
Description	
Percentage	100
MHS	Electricity PED Heat pump air-to-water
SAP Code	204
Boiler Efficiency Type	SAP Table
Efficiency	250
MHS Controls	CHD Time and temperature zone control
Delayed Start Stat	No
Ctrl SAP Code	2207
Boiler Compensator	None
Pumped	Pump in heated space
Heat Emitter	Underfloor
Under Floor Heating	Yes - Pipes in thin screed
Main Heating 2	None
Smoke Control Area	Unknown
Community Heating	None
Secondary Heating	None
Water Heating	
Type	MainHeating1
WHS	HWP From main heating 1
SAP Code	901
Immersion Heater Type	Dual
Supplementary Immersion	Yes
Hot Water Cylinder	
Cylinder Type	HotWaterCylinder
Cylinder Insulation Type	Foam
Insulation Thickness	80 mm
Cylinder Volume	110.00
Cylinder Stat	Yes
Pipes Insulated	Yes
Cylinder in Heated Space	Yes
Separate Time Control	Yes
Flue Gas Heat Recovery System	None
Waste Water Heat Recovery	none
PV Unit	
Type	One Dwelling
PVUnit 1	Cells Peak = 8, Orientation = South, Elevation = _45, Overshading = NoneOrLittle
Wind Turbine	None
Terrain Type:	Urban
Small Scale Hydro	None
Special Features	None

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
 CALCULATION OF FABRIC ENERGY EFFICIENCY
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
First floor	50.0000 (1c)	x 2.6000 (2c)	= 130.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 250.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1200 (8)
Pressure test					Yes
Measured/design q50					8.0000
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)					0.5200 (18)
Number of sides on which dwelling is sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4420 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000 (22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750 (22a)
(22b)m	0.5967	0.5636	0.5636	0.4973	0.4531	0.4310	0.4089	0.4089	0.4641	0.4973	0.5304	0.5636 (22b)
Effective ach	0.6780	0.6588	0.6588	0.6236	0.6026	0.5929	0.5836	0.5836	0.6077	0.6236	0.6407	0.6588 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.8900	3.0000	5.6700		(26)
Opening Type 2 (Uw = 1.80)			11.3100	1.6791	18.9907		(27)
Heat Loss Floor 1			50.0000	0.2200	11.0000		(28a)
External Wall 1	100.0000	13.2000	86.8000	0.3000	26.0400		(29a)
External Roof 1	50.0000		50.0000	0.1600	8.0000		(30)
Total net area of external elements Aum(A, m ²)			200.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 69.7007		(33)
Party Wall 1			50.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4080 (36)
Total fabric heat loss							(33) + (36) = 85.1087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.9371	54.3505	54.3505	51.4494	49.7167	48.9109	48.1453	48.1453	50.1348	51.4494	52.8546	54.3505 (38)
(39)m	141.0458	139.4592	139.4592	136.5580	134.8254	134.0195	133.2540	133.2540	135.2435	136.5580	137.9633	139.4592 (39)
(40)m	1.4105	1.3946	1.3946	1.3656	1.3483	1.3402	1.3325	1.3325	Average = Sum(39)m / 12 = 1.3524	1.3656	1.3796	1.3946 (40)
(41)m	31	28	31	30	31	30	31	31	Average = Sum(40)m / 12 = 30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy, N												2.7395 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36												104.4881 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)												
(44)m	114.9370	110.7574	106.5779	102.3984	98.2189	94.0393	94.0393	98.2189	102.3984	106.5779	110.7574	114.9370 (44)
(45)m	170.8560	149.4317	154.2001	134.4354	128.9940	111.3120	103.1469	118.3626	119.7762	139.5877	152.3709	165.4649 (45)
Energy content (annual)												Total = Sum(45)m = 1647.9384 (45)
(46)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary circuit loss (annual) from Table 3												0.0000 (58)
(59)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
(65)m	36.3069	31.7542	32.7675	28.5675	27.4112	23.6538	21.9187	25.1521	25.4525	29.6624	32.3788	35.1613 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763 (66)
(67)m	25.6979	22.8247	18.5623	14.0528	10.5047	8.8685	9.5827	12.4560	16.7183	21.2278	24.7760	26.4121 (67)
(68)m	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179 (68)
(69)m	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976 (69)
(70)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
(71)m	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810 (71)
(72)m	48.7996	47.2533	44.0424	39.6771	36.8430	32.8525	29.4607	33.8065	35.3506	39.8688	44.9706	47.2598 (72)
(73)m	394.9182	393.1585	378.9824	355.8382	331.4433	308.8872	294.8997	299.4589	311.9682	335.2653	361.9279	382.7827 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W					
East		4.8000	19.8726	0.6300	0.7000	0.7700	29.1519 (76)					
South		0.7200	47.3233	0.6300	0.7000	0.7700	10.4131 (78)					
West		5.7900	19.8726	0.6300	0.7000	0.7700	35.1645 (80)					
(83)m	74.7295	141.6469	219.9904	318.9719	383.8415	399.5578	388.1329	340.1415	260.2165	170.5844	92.2996	62.0523 (83)
(84)m	469.6476	534.8055	598.9727	674.8101	715.2847	708.4450	683.0326	639.6004	572.1847	505.8497	454.2275	444.8350 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.2354	49.7955	49.7955	50.8534	51.5069	51.8167	52.1144	52.1144	51.3477	50.8534	50.3354	49.7955
alpha	4.2824	4.3197	4.3197	4.3902	4.4338	4.4544	4.4743	4.4743	4.4232	4.3902	4.3557	4.3197
(86)m	0.9992	0.9984	0.9960	0.9890	0.9626	0.8853	0.7163	0.7477	0.9474	0.9925	0.9986	0.9993 (86)
(87)m	19.3341	19.4739	19.7559	20.0852	20.4875	20.7908	20.9481	20.9381	20.6703	20.1950	19.6677	19.3809 (87)
(88)m	19.7586	19.7707	19.7707	19.7929	19.8063	19.8125	19.8184	19.8184	19.8030	19.7929	19.7822	19.7707 (88)
(89)m	0.9988	0.9978	0.9943	0.9839	0.9414	0.8109	0.5487	0.5805	0.9049	0.9879	0.9980	0.9990 (89)
(90)m	18.2496	18.3984	18.6798	19.0240	19.4260	19.6998	19.8056	19.8024	19.5979	19.1348	18.6011	18.3057 (90)
Living area fraction									fLA = Living area / (4) =			0.1500 (91)
(92)m	18.4122	18.5598	18.8412	19.1832	19.5852	19.8635	19.9769	19.9727	19.7587	19.2938	18.7611	18.4669 (92)
Temperature adjustment												0.0000
(93)m	18.4122	18.5598	18.8412	19.1832	19.5852	19.8635	19.9769	19.9727	19.7587	19.2938	18.7611	18.4669 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)m	0.9983	0.9969	0.9925	0.9802	0.9361	0.8149	0.5742	0.6059	0.9027	0.9851	0.9972	0.9985 (94)
(95)m	468.8644	533.1650	594.4681	661.4456	669.5981	577.3147	392.2206	387.5193	516.5090	498.2993	452.9490	444.1803 (95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000 (96)
(97)m	1962.2629	1891.0324	1679.2617	1431.5614	1063.1246	705.4070	410.0149	409.4554	738.2596	1159.8963	1622.6002	1892.0347 (97)
(98)m	1111.0885	912.4869	807.0864	554.4834	292.7837	0.0000	0.0000	0.0000	0.0000	492.2282	842.1488	1077.2037 (98)
Space heating (October to May) (kWh/year)												6089.5097 (98)
Space heating requirement in kWh/m ² /year												(98) / (4) = 60.8951 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	0.0000	0.0000	0.0000	0.0000	0.0000	13.4000	15.4000	15.2000	0.0000	0.0000	0.0000	0.0000
(100)m	0.0000	0.0000	0.0000	0.0000	0.0000	1420.6071	1145.9840	1172.6348	0.0000	0.0000	0.0000	0.0000 (100)
(101)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.6035	0.6850	0.6544	0.0000	0.0000	0.0000	0.0000 (101)
(102)m	0.0000	0.0000	0.0000	0.0000	0.0000	857.4019	784.9575	767.4253	0.0000	0.0000	0.0000	0.0000 (102)
(103)m	0.0000	0.0000	0.0000	0.0000	0.0000	905.7706	859.8998	827.5481	0.0000	0.0000	0.0000	0.0000 (103)
(104)m	0.0000	0.0000	0.0000	0.0000	0.0000	34.8254	55.7571	44.7313	0.0000	0.0000	0.0000	0.0000 (104)
(98)m	0.0000	0.0000	0.0000	0.0000	0.0000	102.5795	32.7507	42.9764	0.0000	0.0000	0.0000	0.0000 (98)
(104)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
(106)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (106)
(107)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement in kWh/m ² /year												Total = Sum(107)6.8 = 0.0000 (107)
												(107) / (4) = 0.0000 (108)

8f. Fabric Energy Efficiency

Fabric Energy Efficiency	(99) + (108) =	60.8951
Fabric Energy Efficiency rounded		60.9 (109)

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
 CALCULATION OF ENERGY RATINGS
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
First floor	50.0000 (1c)	x 2.6000 (2c)	= 130.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 250.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	+	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	+	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1200 (8)
Pressure test					Yes
Measured/design q50					8.0000
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)					0.5200 (18)
Number of sides on which dwelling is sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4420 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000 (22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750 (22a)
(22b)m	0.5967	0.5636	0.5636	0.4973	0.4531	0.4310	0.4089	0.4089	0.4641	0.4973	0.5304	0.5636 (22b)
Effective ach	0.6780	0.6588	0.6588	0.6236	0.6026	0.5929	0.5836	0.5836	0.6077	0.6236	0.6407	0.6588 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.8900	3.0000	5.6700		(26)
Opening Type 2 (Uw = 1.80)			11.3100	1.6791	18.9907		(27)
Heat Loss Floor 1			50.0000	0.2200	11.0000		(28a)
External Wall 1	100.0000	13.2000	86.8000	0.3000	26.0400		(29a)
External Roof 1	50.0000		50.0000	0.1600	8.0000		(30)
Total net area of external elements Aum(A, m ²)			200.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 69.7007		(33)
Party Wall 1			50.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4080 (36)
Total fabric heat loss							(33) + (36) = 85.1087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.9371	54.3505	54.3505	51.4494	49.7167	48.9109	48.1453	48.1453	50.1348	51.4494	52.8546	54.3505 (38)
(39)m	141.0458	139.4592	139.4592	136.5580	134.8254	134.0195	133.2540	133.2540	135.2435	136.5580	137.9633	139.4592 (39)
(40)m	1.4105	1.3946	1.3946	1.3656	1.3483	1.3402	1.3325	1.3325	Average = Sum(39)m / 12 = 1.3676		1.3796	1.3946 (40)
(41)m	31	28	31	30	31	30	31	31	Average = Sum(40)m / 12 = 30		31	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N 2.7395 (42)
 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 104.4881 (43)
 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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	114.9370	110.7574	106.5779	102.3984	98.2189	94.0393	94.0393	98.2189	102.3984	106.5779	110.7574	114.9370 (44)
(45)m	170.8560	149.4317	154.2001	134.4354	128.9940	111.3120	103.1469	118.3626	119.7762	139.5877	152.3709	165.4649 (45)
Energy content (annual)										Total = Sum(45)m = 1647.9384 (45)		
(46)m	25.6284	22.4148	23.1300	20.1653	19.3491	16.6968	15.4720	17.7544	17.9664	20.9381	22.8556	24.8197 (46)
Water storage loss:												
b) If manufacturer declared cylinder loss factor is not known :												
Cylinder volume (litres) including any solar storage within same cylinder												110.0000 (50)
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.7061 (55)
(57)m	21.8895	19.7712	21.8895	21.1834	21.8895	21.1834	21.8895	21.8895	21.1834	21.8895	21.1834	21.8895 (57)
Primary circuit loss (annual) from Table 3												360.0000 (58)
(59)m	30.5753	27.6164	30.5753	29.5890	30.5753	29.5890	30.5753	30.5753	29.5890	30.5753	29.5890	30.5753 (59)
(62)m	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Water heat.	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (64)
(65)m	98.7815	87.5962	93.2435	85.3178	84.8624	77.6292	76.2683	81.3275	80.4436	88.3848	91.2813	96.9890 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 2265.6702 (64)												

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	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716	164.3716 (66)
(67)m	80.3060	71.3271	58.0071	43.9151	32.8270	27.7140	29.9459	38.9248	52.2448	66.3368	77.4249	82.5379 (67)
(68)m	382.5788	386.5487	376.5445	355.2468	328.3622	303.0945	286.2141	282.2441	292.2483	313.5461	340.4307	365.6984 (68)
(69)m	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767	54.1767 (69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
(71)m	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810 (71)
(72)m	132.7709	130.3514	125.3272	118.4969	114.0624	107.8184	102.5111	109.3111	111.7272	118.7968	126.7796	130.3615 (72)
(73)m	714.6228	707.1944	678.8460	636.6260	594.2188	557.5940	537.6383	549.4473	575.1876	617.6469	663.6023	697.5651 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	4.8000	19.8726	0.6300	0.7000	0.7700	29.1519 (76)		
South	0.7200	47.3233	0.6300	0.7000	0.7700	10.4131 (78)		
West	5.7900	19.8726	0.6300	0.7000	0.7700	35.1645 (80)		

(83)m	74.7295	141.6469	219.9904	318.9719	383.8415	399.5578	388.1329	340.1415	260.2165	170.5844	92.2996	62.0523 (83)
(84)m	789.3523	848.8414	898.8364	955.5979	978.0603	957.1518	925.7712	889.5888	835.4040	788.2313	755.9018	759.6173 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.2354	49.7955	49.7955	50.8534	51.5069	51.8167	52.1144	52.1144	51.3477	50.8534	50.3354	49.7955
alpha	4.2824	4.3197	4.3197	4.3902	4.4338	4.4544	4.4743	4.4743	4.4232	4.3902	4.3557	4.3197
(86)m	0.9935	0.9904	0.9817	0.9619	0.9013	0.7693	0.5660	0.5854	0.8471	0.9626	0.9897	0.9939 (86)
(87)m	19.8991	19.9996	20.1970	20.4229	20.6858	20.8565	20.9242	20.9220	20.8040	20.5085	20.1378	19.9323 (87)
(88)m	19.7586	19.7707	19.7707	19.7929	19.8063	19.8125	19.8184	19.8184	19.8030	19.7929	19.7822	19.7707 (88)
(89)m	0.9913	0.9871	0.9749	0.9467	0.8582	0.6708	0.4150	0.4310	0.7656	0.9437	0.9856	0.9917 (89)
(90)m	18.3170	18.4720	18.7578	19.0969	19.4643	19.6670	19.7250	19.7242	19.6092	19.2219	18.6826	18.3746 (90)
Living area fraction	fLA = Living area / (4) =											0.1500 (91)
(92)m	18.5543	18.7011	18.9736	19.2958	19.6475	19.8454	19.9049	19.9039	19.7884	19.4149	18.9008	18.6083 (92)
Temperature adjustment	0.0000											
(93)m	18.5543	18.7011	18.9736	19.2958	19.6475	19.8454	19.9049	19.9039	19.7884	19.4149	18.9008	18.6083 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)m	0.9882	0.9831	0.9688	0.9385	0.8512	0.6739	0.4267	0.4429	0.7644	0.9357	0.9813	0.9887 (94)
(95)m	780.0717	834.4738	870.7658	896.8112	832.4815	645.0083	395.0137	394.0238	638.6108	737.5412	741.7735	751.0590 (95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000 (96)
(97)m	1982.3035	1910.7466	1697.7272	1446.9386	1071.5281	702.9888	400.4122	400.2826	742.2750	1176.4342	1641.8779	1911.7482 (97)
(98)m	894.4605	723.2553	615.2593	396.0918	177.8507	0.0000	0.0000	0.0000	0.0000	326.5363	648.0751	863.5528 (98)
Space heating (October to May) (kWh/year)												4645.0818 (98)
Space heating requirement in kWh/m ² /year												(98) / (4) = 46.4508 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)												
Fraction of space heat from main system(s)	1.0000 (202)												
Efficiency of main space heating system 1 (in %)	250.0000 (206)												
Efficiency of secondary/supplementary heating system, %	0.0000 (208)												
Space heating:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	894.4605	723.2553	615.2593	396.0918	177.8507	0.0000	0.0000	0.0000	0.0000	326.5363	648.0751	863.5528 (98)	
(211)m	357.7842	289.3021	246.1037	158.4367	71.1403	0.0000	0.0000	0.0000	0.0000	130.6145	259.2301	345.4211 (211)	
(215)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Annual totals kWh/year													
Space heating fuel used, main system 1	1858.0327 (211)												
Space heating fuel used, secondary	0.0000 (215)												
Water heating	(64)m	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (64)
Efficiency of water heater	(217)m	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571 (217)
(219)m	156.3246	137.7736	144.6655	129.6455	127.0212	113.4591	108.9283	119.5793	119.3841	134.4368	142.2003	152.5508 (219)	
Water heating fuel used	1585.9691 (219)												
Electricity for pumps, fans and electric keep-hot (Table 4f):													
central heating pump	130.0000 (230c)												
Total electricity for the above, kWh/year	130.0000 (231)												
Electricity for lighting (calculated in Appendix L)	567.2916 (232)												
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 8.00 * 1054 * 1.00)											-6745.6000	(233)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1858.0327	11.4600	212.9306 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating cost (other fuel)	1585.9691	11.4600	181.7521 (247)
Pumps and fans for heating	130.0000	11.4600	14.8980 (249)
Energy for lighting	567.2916	11.4600	65.0116 (250)

Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-6745.6000	11.4600	-773.0458 (252)
Total energy cost			-298.4535 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4700 (256)
Energy cost factor (ECF)		$[(255) \times (256)] / [(4) + 45.0] =$	-0.9674 (257)
SAP value			113.4952
SAP rating (Section 12)			113 (258)
SAP band			A

 10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1858.0327	20.4300	379.5961 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating cost (other fuel)	1585.9691	20.4300	324.0135 (247)
Pumps and fans for heating	130.0000	20.4300	26.5590 (249)
Energy for lighting	567.2916	20.4300	115.8977 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-6745.6000	20.4300	-1378.1261 (252)
Total energy cost			-428.0598 (255)

 12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1858.0327	0.5170	960.6029 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating cost (other fuel)	1585.9691	0.5170	819.9460 (264)
Space and water heating			1780.5490 (265)
Pumps and fans	130.0000	0.5170	67.2100 (267)
Energy for lighting	567.2916	0.5170	293.2897 (268)
Energy saving/generation technologies			
PV Unit	-6745.6000	0.5290	-3568.4224 (269)
Total CO2, kg/year			-1427.3737 (272)
CO2 emissions per m2			-14.2700 (273)
EI value			113.1909
EI rating			113 (274)
EI band			A

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1858.0327	2.9200	5425.4556 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating cost (other fuel)	1585.9691	2.9200	4631.0299 (264)
Space and water heating			10056.4855 (265)
Pumps and fans	130.0000	2.9200	379.6000 (267)
Energy for lighting	567.2916	2.9200	1656.4914 (268)
Energy saving/generation technologies			
PV Unit	-6745.6000	2.9200	-19697.1520 (269)
Primary energy kWh/year			-7604.5751 (272)
Primary energy kWh/m2/year			-76.0458 (273)

CALCULATION DETAILS FOR survey reference no '001'
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
First floor	50.0000 (1c)	x 2.6000 (2c)	= 130.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 250.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1200 (8)
Pressure test					Yes
Measured/design q50					8.0000
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)					0.5200 (18)
Number of sides on which dwelling is sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.4420 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000 (22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750 (22a)
(22b)m	0.5967	0.5636	0.5636	0.4973	0.4531	0.4310	0.4089	0.4089	0.4641	0.4973	0.5304	0.5636 (22b)
Effective ach	0.6780	0.6588	0.6588	0.6236	0.6026	0.5929	0.5836	0.5836	0.6077	0.6236	0.6407	0.6588 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.8900	3.0000	5.6700		(26)
Opening Type 2 (Uw = 1.80)			11.3100	1.6791	18.9907		(27)
Heat Loss Floor 1			50.0000	0.2200	11.0000		(28a)
External Wall 1	100.0000	13.2000	86.8000	0.3000	26.0400		(29a)
External Roof 1	50.0000		50.0000	0.1600	8.0000		(30)
Total net area of external elements Aum(A, m ²)			200.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 69.7007		(33)
Party Wall 1			50.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4080 (36)
Total fabric heat loss							(33) + (36) = 85.1087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.9371	54.3505	54.3505	51.4494	49.7167	48.9109	48.1453	48.1453	50.1348	51.4494	52.8546	54.3505 (38)
(39)m	141.0458	139.4592	139.4592	136.5580	134.8254	134.0195	133.2540	133.2540	135.2435	136.5580	137.9633	139.4592 (39)
(40)m	1.4105	1.3946	1.3946	1.3656	1.3483	1.3402	1.3325	1.3325	Average = Sum(39)m / 12 = 1.3676		1.3796	1.3946 (40)
(41)m	31	28	31	30	31	30	31	31	Average = Sum(40)m / 12 = 30		31	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N												2.7395 (42)	
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36													104.4881 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)													
(44)m	114.9370	110.7574	106.5779	102.3984	98.2189	94.0393	94.0393	98.2189	102.3984	106.5779	110.7574	114.9370 (44)	
(45)m	170.8560	149.4317	154.2001	134.4354	128.9940	111.3120	103.1469	118.3626	119.7762	139.5877	152.3709	165.4649 (45)	
Energy content (annual)													Total = Sum(45)m = 1647.9384 (45)
(46)m	25.6284	22.4148	23.1300	20.1653	19.3491	16.6968	15.4720	17.7544	17.9664	20.9381	22.8556	24.8197 (46)	
Water storage loss:													
b) If manufacturer declared cylinder loss factor is not known :													
Cylinder volume (litres) including any solar storage within same cylinder													110.0000 (50)
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0115 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.5400 (53)
Enter (49) or (54) in (55)													0.7061 (55)
(57)m	21.8895	19.7712	21.8895	21.1834	21.8895	21.1834	21.8895	21.8895	21.1834	21.8895	21.1834	21.8895 (57)	
Primary circuit loss (annual) from Table 3													360.0000 (58)
(59)m	30.5753	27.6164	30.5753	29.5890	30.5753	29.5890	30.5753	30.5753	29.5890	30.5753	29.5890	30.5753 (59)	
(62)m	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (62)	
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
Water heat.	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (64)	
(65)m	98.7815	87.5962	93.2435	85.3178	84.8624	77.6292	76.2683	81.3275	80.4436	88.3848	91.2813	96.9890 (65)	
Solar input (sum of months) = Sum(63)m = 0.0000 (63)													
Total per year (kWh/year) = Sum(64)m = 2265.6702 (64)													

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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763 (66)
(67)m	32.1224	28.5308	23.2028	17.5660	13.1308	11.0856	11.9784	15.5699	20.8979	26.5347	30.9700	33.0152 (67)
(68)m	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179 (68)
(69)m	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976 (69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
(71)m	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810 (71)
(72)m	132.7709	130.3514	125.3272	118.4969	114.0624	107.8184	102.5111	109.3111	111.7272	118.7968	126.7796	130.3615 (72)
(73)m	495.3139	491.9628	474.9078	448.1712	421.2888	396.0701	380.3458	388.0775	402.5244	429.5003	459.9309	482.4875 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	4.8000	19.8726	0.6300	0.7000	0.7700	29.1519 (76)		
South	0.7200	47.3233	0.6300	0.7000	0.7700	10.4131 (78)		
West	5.7900	19.8726	0.6300	0.7000	0.7700	35.1645 (80)		

(83)m	74.7295	141.6469	219.9904	318.9719	383.8415	399.5578	388.1329	340.1415	260.2165	170.5844	92.2996	62.0523 (83)
(84)m	570.0434	633.6097	694.8981	767.1431	805.1303	795.6280	768.4787	728.2190	662.7408	600.0847	552.2305	544.5398 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.2354	49.7955	49.7955	50.8534	51.5069	51.8167	52.1144	52.1144	51.3477	50.8534	50.3354	49.7955
alpha	4.2824	4.3197	4.3197	4.3902	4.4338	4.4544	4.4743	4.4743	4.4232	4.3902	4.3557	4.3197
(86)m	0.9982	0.9969	0.9929	0.9823	0.9448	0.8460	0.6581	0.6849	0.9175	0.9857	0.9969	0.9983 (86)
(87)m	19.7544	19.8586	20.0672	20.3106	20.6036	20.8135	20.9118	20.9070	20.7363	20.3952	20.0042	19.7898 (87)
(88)m	19.7586	19.7707	19.7707	19.7929	19.8063	19.8125	19.8184	19.8184	19.8030	19.7929	19.7822	19.7707 (88)
(89)m	0.9975	0.9957	0.9901	0.9745	0.9161	0.7599	0.4939	0.5185	0.8596	0.9775	0.9956	0.9977 (89)
(90)m	18.1064	18.2675	18.5718	18.9409	19.3630	19.6297	19.7204	19.7184	19.5396	19.0658	18.4893	18.1672 (90)
Living area fraction	fLA = Living area / (4) =											0.1500 (91)
(92)m	18.3536	18.5062	18.7961	19.1464	19.5491	19.8073	19.8991	19.8967	19.7191	19.2652	18.7165	18.4106 (92)
Temperature adjustment												0.0000
(93)m	18.3536	18.5062	18.7961	19.1464	19.5491	19.8073	19.8991	19.8967	19.7191	19.2652	18.7165	18.4106 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)m	0.9964	0.9940	0.9867	0.9685	0.9080	0.7595	0.5063	0.5309	0.8542	0.9721	0.9939	0.9967 (94)
(95)m	567.9750	629.7977	685.6805	743.0110	731.0511	604.2656	389.0553	386.5827	566.0811	583.3720	548.8398	542.7211 (95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000 (96)
(97)m	1953.9859	1883.5631	1672.9729	1426.5339	1058.2544	697.8770	399.6385	399.3207	732.9021	1155.9882	1616.4478	1884.1803 (97)
(98)m	1031.1921	842.5304	734.5455	492.1365	243.4392	0.0000	0.0000	0.0000	0.0000	426.0264	768.6778	998.0457 (98)
Space heating (October to May) (kWh/year)												5536.5936 (98)
Space heating requirement in kWh/m ² /year												(98) / (4) = 55.3659 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												250.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(98)m	1031.1921	842.5304	734.5455	492.1365	243.4392	0.0000	0.0000	0.0000	0.0000	426.0264	768.6778	998.0457 (98)
(211)m	412.4768	337.0121	293.8182	196.8546	97.3757	0.0000	0.0000	0.0000	0.0000	170.4106	307.4711	399.2183 (211)
(215)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Annual totals kWh/year												
Space heating fuel used, main system 1												2214.6374 (211)
Space heating fuel used, secondary												0.0000 (215)
Water heating												
(64)m	223.3209	196.8194	206.6650	185.2079	181.4589	162.0845	155.6118	170.8275	170.5487	192.0526	203.1433	217.9298 (64)
Efficiency of water heater												142.8571 (216)
(217)m	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571	142.8571 (217)
(219)m	156.3246	137.7736	144.6655	129.6455	127.0212	113.4591	108.9283	119.5793	119.3841	134.4368	142.2003	152.5508 (219)
Water heating fuel used												1585.9691 (219)
Electricity for pumps, fans and electric keep-hot (Table 4f):												
central heating pump												130.0000 (230c)
Total electricity for the above, kWh/year												130.0000 (231)
Electricity for lighting (calculated in Appendix L)												567.2916 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 8.00 * 1054 * 1.00)												-6745.6000 (233)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2214.6374	0.5170	1144.9676 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating cost (other fuel)	1585.9691	0.5170	819.9460 (264)
Space and water heating			1964.9136 (265)
Pumps and fans	130.0000	0.5170	67.2100 (267)

Energy for lighting	567.2916	0.5170	293.2897 (268)
Energy saving/generation technologies			
PV Unit	-6745.6000	0.5290	-3568.4224 (269)
Total CO ₂ , kg/year			-1243.0091 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			-12.4300 (273)

16 CO ₂ EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER			-12.4300 ZC1
Total Floor Area		TFA	100.0000
Assumed number of occupants		N	2.7395
CO ₂ emission factor in Table 12 for electricity displaced from grid		EF	0.5290
CO ₂ emissions from appliances, equation (L14)			15.4821 ZC2
CO ₂ emissions from cooking, equation (L16)			1.8475 ZC3
Total CO ₂ emissions			4.8996 ZC4
Residual CO ₂ emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO ₂ emissions			4.8996 ZC8

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
 CALCULATION OF TARGET EMISSIONS
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
First floor	50.0000 (1c)	x 2.6000 (2c)	= 130.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 250.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)

Air changes per hour
 Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1200 (8)
 Pressure test Yes
 Measured/design q50 10.0000
 If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16) 0.6200 (18)
 Number of sides on which dwelling is sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.5270 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000 (22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750 (22a)
(22b)m	0.7115	0.6719	0.6719	0.5929	0.5402	0.5138	0.4875	0.4875	0.5534	0.5929	0.6324	0.6719 (22b)
Effective ach	0.7531	0.7257	0.7257	0.6758	0.6459	0.6320	0.6188	0.6188	0.6531	0.6758	0.7000	0.7257 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Doors			1.8500	2.0000	3.7000		(26)
Windows (Uw = 2.00)			23.1500	1.8519	42.8704		(27)
Heat Loss Floor 1			50.0000	0.2500	12.5000		(28a)
External Wall 1	100.0000	25.0000	75.0000	0.3500	26.2500		(29a)
External Roof 1	50.0000		50.0000	0.1600	8.0000		(30)
Total net area of external elements Aum(A, m ²)			200.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.3204		(33)
Party Wall 1			50.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (User defined value 0.110 * total exposed area) 22.0000 (36)
 Total fabric heat loss (33) + (36) = 115.3204 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	62.1291	59.8737	59.8737	55.7494	53.2863	52.1407	51.0523	51.0523	53.8806	55.7494	57.7471	59.8737 (38)
(39)m	177.4495	175.1941	175.1941	171.0698	168.6067	167.4610	166.3727	166.3727	169.2010	171.0698	173.0675	175.1941 (39)
(40)m	1.7745	1.7519	1.7519	1.7107	1.6861	1.6746	1.6637	1.6637	Average = Sum(39)m / 12 =	1.6920	1.7107	1.7307
(41)m	31	28	31	30	31	30	31	31	Average = Sum(40)m / 12 =	30	31	30

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N 2.7395 (42)
 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 104.4881 (43)
 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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	114.9370	110.7574	106.5779	102.3984	98.2189	94.0393	94.0393	98.2189	102.3984	106.5779	110.7574	114.9370 (44)
(45)m	170.8560	149.4317	154.2001	134.4354	128.9940	111.3120	103.1469	118.3626	119.7762	139.5877	152.3709	165.4649 (45)
Energy content (annual)												Total = Sum(45)m =
(46)m	25.6284	22.4148	23.1300	20.1653	19.3491	16.6968	15.4720	17.7544	17.9664	20.9381	22.8556	24.8197 (46)

Water storage loss:

b) If manufacturer declared cylinder loss factor is not known :
 Cylinder volume (litres) including any solar storage within same cylinder 150.0000 (50)
 Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0191 (51)
 Volume factor from Table 2a 0.9283 (52)
 Temperature factor from Table 2b 0.5400 (53)
 Enter (49) or (54) in (55) 1.4364 (55)
 (57)m 44.5282 40.2190 44.5282 43.0918 44.5282 43.0918 44.5282 44.5282 43.0918 44.5282 43.0918 44.5282 (57)
 Primary circuit loss (annual) from Table 3 610.0000 (58)
 (59)m 51.8082 46.7945 51.8082 50.1370 51.8082 50.1370 51.8082 51.8082 50.1370 51.8082 50.1370 51.8082 (59)
 (62)m 267.1924 236.4452 250.5366 227.6642 225.3304 204.5408 199.4833 214.6990 213.0050 235.9241 245.5996 261.8013 (62)
 (63)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
 Solar input (sum of months) = Sum(63)m = 0.0000 (63)
 (65)m 267.1924 236.4452 250.5366 227.6642 225.3304 204.5408 199.4833 214.6990 213.0050 235.9241 245.5996 261.8013 (64)
 Total per year (kWh/year) = Sum(64)m = 2782.2220 (64)
 (65)m 133.8787 119.2969 128.3407 119.2828 119.9596 111.5943 111.3655 116.4247 114.4086 123.4820 125.2463 132.0862 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763 (66)
(67)m	38.8481	34.5045	28.0610	21.2439	15.8801	13.4067	14.4864	18.8299	25.2735	32.0905	37.4543	39.9278 (67)
(68)m	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179 (68)
(69)m	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976 (69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
(71)m	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810 (71)
(72)m	179.9445	177.5251	172.5009	165.6706	161.2361	154.9920	149.6848	156.4848	158.9009	165.9705	173.9532	177.5352 (72)
(73)m	549.2133	545.1102	526.9396	499.0227	471.2117	445.5649	430.0275	438.5112	454.0736	482.2297	513.5890	536.5738 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
East	23.1500	19.8726	0.7200	0.7000	0.7700	160.6825 (76)						
(83)m	160.6825	311.4484	497.7948	739.1072	899.2831	938.3561	910.7809	792.6725	595.1341	379.2856	199.7701	132.5472 (83)
(84)m	709.8958	856.5586	1024.7344	1238.1300	1370.4948	1383.9209	1340.8084	1231.1837	1049.2077	861.5153	713.3591	669.1210 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.1348	39.6386	39.6386	40.5942	41.1872	41.4690	41.7403	41.7403	41.0426	40.5942	40.1256	39.6386
alpha	3.6090	3.6426	3.6426	3.7063	3.7458	3.7646	3.7827	3.7827	3.7362	3.7063	3.6750	3.6426
(86)m	0.9954	0.9907	0.9764	0.9372	0.8389	0.6797	0.4886	0.5259	0.8183	0.9616	0.9921	0.9960 (86)
(87)m	19.1269	19.3458	19.7413	20.1957	20.6421	20.8876	20.9768	20.9702	20.7648	20.2190	19.5432	19.1767 (87)
(88)m	19.4932	19.5089	19.5089	19.5381	19.5556	19.5638	19.5716	19.5716	19.5513	19.5381	19.5239	19.5089 (88)
(89)m	0.9938	0.9873	0.9671	0.9125	0.7756	0.5620	0.3281	0.3561	0.7190	0.9406	0.9886	0.9944 (89)
(90)m	17.8446	18.0733	18.4633	18.9209	19.3318	19.5180	19.5676	19.5663	19.4366	18.9548	18.2820	17.9059 (90)
Living area fraction	fLA = Living area / (4) = 0.1500 (91)											
(92)m	18.0369	18.2642	18.6550	19.1121	19.5283	19.7234	19.7790	19.7769	19.6359	19.1444	18.4712	18.0965 (92)
Temperature adjustment	0.0000											
(93)m	18.0369	18.2642	18.6550	19.1121	19.5283	19.7234	19.7790	19.7769	19.6359	19.1444	18.4712	18.0965 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)m	0.9913	0.9832	0.9598	0.9033	0.7742	0.5766	0.3525	0.3820	0.7260	0.9327	0.9850	0.9922 (94)
(95)m	703.7293	842.1556	983.5843	1118.4545	1061.0338	797.9098	472.6676	470.3457	761.7213	803.5724	702.6445	663.9084 (95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000 (96)
(97)m	2402.1188	2323.8108	2076.9233	1781.2024	1319.9104	857.9702	478.9846	478.6422	902.8328	1427.4793	1985.2890	2311.9557 (97)
(98)m	1263.6018	995.6723	813.4442	477.1785	192.6041	0.0000	0.0000	0.0000	0.0000	464.1867	923.5040	1226.1472 (98)
Space heating (October to May) (kWh/year)	6356.3389 (98)											
Space heating requirement in kWh/m ² /year	(98) / (4) = 63.5634 (99)											

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.1000 (201)
Fraction of space heat from main system(s)	0.9000 (202)
Efficiency of main space heating system 1 (in %)	78.9000 (206)
Efficiency of secondary/supplementary heating system, %	100.0000 (208)

Space heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(98)m	1263.6018	995.6723	813.4442	477.1785	192.6041	0.0000	0.0000	0.0000	0.0000	464.1867	923.5040	1226.1472 (98)
(211)m	1441.3709	1135.7479	927.8831	544.3101	219.7005	0.0000	0.0000	0.0000	0.0000	529.4905	1053.4266	1398.6470 (211)
(215)m	126.3602	99.5672	81.3444	47.7178	19.2604	0.0000	0.0000	0.0000	0.0000	46.4187	92.3504	122.6147 (215)
Annual totals kWh/year	6356.3389 (98)											
Space heating fuel used, main system 1	7250.5767 (211)											
Space heating fuel used, secondary	635.6339 (215)											

Water heating	3785.5216 (219)											
(64)m	267.1924	236.4452	250.5366	227.6642	225.3304	204.5408	199.4833	214.6990	213.0050	235.9241	245.5996	261.8013 (64)
Efficiency of water heater	68.8000 (216)											
(217)m	76.7563	76.5538	76.0534	75.0813	72.8550	68.8000	68.8000	68.8000	68.8000	74.9300	76.3437	76.7398 (217)
(219)m	348.1049	308.8617	329.4220	303.2234	309.2860	297.2977	289.9467	312.0625	309.6003	314.8592	321.7027	341.1543 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):	175.0000 (230c)										
central heating pump	45.0000 (230e)										
boiler with a fan-assisted flue	175.0000 (231)										
Total electricity for the above, kWh/year	686.0691 (232)										
Electricity for lighting (calculated in Appendix L)	686.0691 (232)										

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	7250.5767	0.1940	1406.6119 (261)
Space heating - secondary	635.6339	0.4220	268.2375 (263)
Water heating cost (other fuel)	3785.5216	0.1940	734.3912 (264)
Space and water heating			2409.2406 (265)
Pumps and fans	175.0000	0.4220	73.8500 (267)
Energy for lighting	686.0691	0.4220	289.5212 (268)
Total CO ₂ , kg/year			2772.6117 (272)
Emissions per m ² for space and water heating			24.8309 (272a)
Emissions per m ² for lighting			2.8952 (272b)

Target Carbon Dioxide Emission Rate (TER)
= [(24.8309 * 1.14 * 1.47 * 1.2251) + (2.8952 * 1.2251)] * 0.60

32.7200 (273)

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
 CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
First floor	50.0000 (1c)	x 2.6000 (2c)	= 130.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 250.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)

Air changes per hour
 Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1200 (8)
 Pressure test Yes
 Measured/design q50 8.0000
 If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16) 0.5200 (18)
 Number of sides on which dwelling is sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.4420 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000 (22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750 (22a)
(22b)m	0.5967	0.5636	0.5636	0.4973	0.4531	0.4310	0.4089	0.4089	0.4641	0.4973	0.5304	0.5636 (22b)
Effective ach	0.6780	0.6588	0.6588	0.6236	0.6026	0.5929	0.5836	0.5836	0.6077	0.6236	0.6407	0.6588 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Opening Type 1			1.8900	3.0000	5.6700		(26)
Opening Type 2 (Uw = 1.80)			11.3100	1.6791	18.9907		(27)
Heat Loss Floor 1			50.0000	0.2200	11.0000		(28a)
External Wall 1	100.0000	13.2000	86.8000	0.3000	26.0400		(29a)
External Roof 1	50.0000		50.0000	0.1600	8.0000		(30)
Total net area of external elements Aum(A, m ²)			200.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 69.7007		(33)
Party Wall 1			50.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4080 (36)
 Total fabric heat loss (33) + (36) = 85.1087 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.9371	54.3505	54.3505	51.4494	49.7167	48.9109	48.1453	48.1453	50.1348	51.4494	52.8546	54.3505 (38)
(39)m	141.0458	139.4592	139.4592	136.5580	134.8254	134.0195	133.2540	133.2540	135.2435	136.5580	137.9633	139.4592 (39)
(40)m	1.4105	1.3946	1.3946	1.3656	1.3483	1.3402	1.3325	1.3325	Average = Sum(39)m / 12 = 1.3524	1.3656	1.3796	1.3946 (40)
(41)m	31	28	31	30	31	30	31	31	Average = Sum(40)m / 12 = 30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N 2.7395 (42)
 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 104.4881 (43)
 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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	114.9370	110.7574	106.5779	102.3984	98.2189	94.0393	94.0393	98.2189	102.3984	106.5779	110.7574	114.9370 (44)
(45)m	170.8560	149.4317	154.2001	134.4354	128.9940	111.3120	103.1469	118.3626	119.7762	139.5877	152.3709	165.4649 (45)
Energy content (annual)												Total = Sum(45)m = 1647.9384 (45)
(46)m	25.6284	22.4148	23.1300	20.1653	19.3491	16.6968	15.4720	17.7544	17.9664	20.9381	22.8556	24.8197 (46)

Water storage loss:

b) If manufacturer declared cylinder loss factor is not known :
 Cylinder volume (litres) including any solar storage within same cylinder 110.0000 (50)
 Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0115 (51)
 Volume factor from Table 2a 1.0294 (52)
 Temperature factor from Table 2b 0.5400 (53)
 Enter (49) or (54) in (55) 0.7061 (55)
 (57)m 21.8895 19.7712 21.8895 21.1834 21.8895 21.1834 21.8895 21.8895 21.1834 21.8895 21.1834 21.8895 (57)
 Primary circuit loss (annual) from Table 3 360.0000 (58)
 (59)m 30.5753 27.6164 28.7408 20.7123 13.7589 13.0192 13.4532 14.6762 22.4877 28.7408 29.5890 30.5753 (59)
 (62)m 223.3209 196.8194 204.8305 176.3312 164.6424 145.5146 138.4896 154.9283 163.4473 190.2180 203.1433 217.9298 (62)
 Aperture area of solar collector 3.0000 (H1)
 Zero-loss collector efficiency 0.7000 (H2)
 Collector heat loss coefficient 1.8000 (H3)
 Collector performance ratio 2.5714 (H4)
 Annual solar radiation per m² 1073.0000 (H5)
 Overshading factor 0.8000 (H6)
 Solar energy available 1802.6400 (H7)
 Solar-to-load ratio 1.0939 (H8)
 Utilisation factor 0.5992 (H9)
 Collector performance factor 0.8796 (H10)
 Dedicated solar storage volume 75.0000 (H11)

Total electricity for the above, kWh/year	205.0000 (231)
Electricity for lighting (calculated in Appendix L)	567.2916 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 8.00 * 1054 * 1.00)	-6745.6000 (233)

 10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1863.1678	11.4600	213.5190 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating cost (other fuel)	903.2384	11.4600	103.5111 (247)
Pumps and fans for heating	130.0000	11.4600	14.8980 (249)
Pump for solar water heating	75.0000	11.4600	8.5950 (249)
Energy for lighting	567.2916	11.4600	65.0116 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-6745.6000	11.4600	-773.0458 (252)
Total energy cost			-367.5110 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4700 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-1.1912 (257)
SAP value		116.6178
SAP rating (Section 12)		117 (258)
SAP band		A

 10a. Fuel costs - using BEDF prices (505)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1863.1678	20.4300	380.6452 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating cost (other fuel)	903.2384	20.4300	184.5316 (247)
Pumps and fans for heating	130.0000	20.4300	26.5590 (249)
Pump for solar water heating	75.0000	20.4300	15.3225 (249)
Energy for lighting	567.2916	20.4300	115.8977 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-6745.6000	20.4300	-1378.1261 (252)
Total energy cost			-551.1701 (255)

 12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1863.1678	0.5170	963.2577 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating cost (other fuel)	903.2384	0.5170	466.9743 (264)
Space and water heating			1430.2320 (265)
Pumps and fans	205.0000	0.5170	105.9850 (267)
Energy for lighting	567.2916	0.5170	293.2897 (268)
Energy saving/generation technologies			
PV Unit	-6745.6000	0.5290	-3568.4224 (269)
Total CO2, kg/year			-1738.9156 (272)
CO2 emissions per m2			-17.3900 (273)
EI value			116.0700
EI rating			116 (274)
EI band			A

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1863.1678	2.9200	5440.4499 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating cost (other fuel)	903.2384	2.9200	2637.4562 (264)
Space and water heating			8077.9061 (265)
Pumps and fans	205.0000	2.9200	598.6000 (267)
Energy for lighting	567.2916	2.9200	1656.4914 (268)
Energy saving/generation technologies			
PV Unit	-6745.6000	2.9200	-19697.1520 (269)
Primary energy kWh/year			-9364.1545 (272)
Primary energy kWh/m2/year			-93.6415 (273)

REGULATIONS COMPLIANCE REPORT - Technical Booklet F1, 2012 Edition
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

New Build (As Designed)

1 TER and DER

Fuel for main heating:Electricity
 Fuel factor:1.14 x 1.47 (electricity)
 Target Carbon Dioxide Emission Rate (TER) 32.72 kg/m²
 Dwelling Carbon Dioxide Emission Rate (DER)-12.43 kg/m²OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.30 (max. 0.30)	0.30 (max. 0.70)	OK
Floor	0.22 (max. 0.25)	0.22 (max. 0.70)	OK
Roof	0.16 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.97 (max. 2.00)	3.00 (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: 8.00 (design value)
 Maximum 10.0 OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
 Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.31 kWh/day
 Permitted by DBSCG 1.58 OK
 Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
 Independent timer for DHW OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:75%
 Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Northern Ireland): Not significant OK
 Based on:
 Overshading: Average
 Windows facing East: 4.80 m², No overhang
 Windows facing South: 0.72 m², No overhang
 Windows facing West: 5.79 m², No overhang
 Ventilation rate: 5.00
 Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
 Photovoltaic array

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

Overheating Calculation Input Data

Dwelling type EndTerrace House
 Number of storeys 2
 Cross ventilation possible No
 Region Northern Ireland
 Front of dwelling faces East
 Overshading Average or unknown
 Thermal mass parameter 250.0
 Night ventilation No
 Ventilation rate during hot weather (ach) 5.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient 412.50 (P1)
 Transmission heat loss coefficient 85.11 (37)
 Summer heat loss coefficient 497.61 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
East	0.000	1.000	None
South	0.000	1.000	None
West	0.000	1.000	None

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
East	4.8000	102.0438	0.6300	0.7000	0.9000	174.9651
South	0.7200	98.3100	0.6300	0.7000	0.9000	25.2845
West	5.7900	102.0438	0.6300	0.7000	0.9000	211.0516
total:						411.3011

	Jun	Jul	Aug	
Solar gains	439	411	371	(P3)
Internal gains	548	528	539	
Total summer gains	986	939	911	(P5)

	1.98	1.89	1.83	
Summer gain/loss ratio	1.98	1.89	1.83	(P6)
Summer external temperature	13.40	15.40	15.20	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	15.63	17.54	17.28	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant

SAP 2009 IMPROVEMENTS
 Calculated by program Elmhurst Energy Systems Design SAP 2009 version 4.04r04

SAP RATING

Current energy efficiency rating: A 113
 Current environmental impact rating: A 113

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
L	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
Q	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic (PV) panels	Already installed
V Wind turbine	SAP increase too small

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 3.1	-£ 123	-312 kg (21.8%)

Measures omitted - SAP change or cost saving too small:			
V Wind turbine	+ 0.3	-£ 13	-33 kg (1.9%)

	Typical annual savings	Energy efficiency	Environmental impact
Lower cost measures (none)			
Sub Total	£0	0.00 kg/m ²	
Higher cost measures (none)			
Sub Total	£0	0.00 kg/m ²	

Potential energy efficiency rating: A 113
 Potential environmental impact rating: A 113

Further improvements to achieve even higher standards				
Solar water heating	£123	3.12 kg/m ²	A 117	A 116
Total Savings	£123	3.12 kg/m ²		

Enhanced energy efficiency rating: A 117
 Enhanced environmental impact rating: A 116

Fuel prices for cost data on this page from database revision number 505 TEST (31 Aug 2022)
 Recommendation texts revision number 4.6 (10 Dec 2012)

Typical heating and lighting costs of this home (per year):

	Current £950	Potential £950	Enhanced £827
Electricity			
Space heating	£510	£510	£511
Water heating	£324	£324	£200
Lighting	£116	£116	£116
Generated (PV)	-£1378	-£1378	-£1378
Total cost	-£428	-£428	-£551
Carbon dioxide emissions	-1.4 tonnes	-1.4 tonnes	-1.7 tonnes
Primary energy	-76 kWh/m ²	-76 kWh/m ²	-94 kWh/m ²

Summary Information

Property Reference: SAP RATING
Survey Reference: 001

Issued on Date: 26.Mar.2013
Prop Type Ref: Detached House

Property: Detached House, Unit 1F, THe Milestone Centre, 75 Quarry Road, Carrickmore, Tyrone, BT79 9AL

SAP Rating: 113 **ACO2 Emissions (t/year):** -1.43 **DER:-12.43 Pass** **Reduction:** 138.0% **FEE:** 60.9 **ZC8:** 4.90
Environmental: 113 **AGeneral Requirements Compliance:** Pass **TER:** 32.72 **HLP:** 1.37 **Energy cost:** £ -428

CfSH Results **Version:** **ENE1 Credits:** N/A **ENE2 Credits:** N/A **ENE7 Credits:** N/A **CfSH Level:** N/A

Surveyor: Conor Loughran, Tel: 028 807 60819 **Surveyor ID:** 7181-0001

Address: Aughnagreggan Rd, Carrickmore, Tyrone, BT79 9JZ

Client: Elmhurst

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 4.04r04

SAP version: SAP 2009, **Regs Region:** Northern Ireland (NI Technical Booklet F1 2011), **Calculation Type:** New Dwelling As Designed

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Page 23 of 27

Orientation	East
1.0 Property Type	House, End-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2011
3.0 Property Age Band	
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Internal Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	20	50	2.4
1st Storey:	20	50	2.6

7.0 Living Area 15

8.0 Thermal Mass Parameter Simple calculation - Medium

9.0 External Walls

Description	Construction	U-Value	Element	Kappa	Gross Area	Nett Area
External Wall 1	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.30		70.00	100.00	86.80

9.1 Party walls

Description	Construction	Element	Kappa	Area
Party Wall 1	Plaster on dabs and single plasterboard on both sides, dense cellular blocks, cavity		70.00	50.00

10.0 External Roofs

Description	Construction	U-Value	Element	Kappa	Gross Area	Nett Area
External Roof 1	Plasterboard, insulated at ceiling level	0.16		9	50.00	50.00

11.0 HeatLoss Floors

Description	Construction	U-Value	Element	Kappa	Area
Heat Loss Floor 1	Slab on ground, screed over insulation	0.22		110	50.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	Solar Trans	Frame Type	Frame Factor	U value
Opening Type 1	SAP table	Solid Door							3.00
Opening Type 2	SAP table	Window	Double Low-E Soft 0.05	16 mm	No	0.63	Wood	0.70	1.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width	Height	Count	Area	Curtain Closed
Opening 1	Solid Door - Opening Type 1	External Wall 1	East	None	0	No	0	0	0	1.89	0
Opening 2	Window - Opening Type 2	External Wall 1	East	None	0	No	0	0	0	4.80	0

Opening 3	Window - Opening Type 2	External Wall 1	West	None	0	No	0	0	0	5.79	0
Opening 4	Window - Opening Type 2	External Wall 1	South	None	0	No	0	0	0	0.72	0

14.0 Conservatory	None
15.0 Draught Proofing	100
16.0 Draught Lobby	No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Accredited	E1 Steel lintel with perforated steel base plate	9.20	0.5	Yes
	E2 Other lintels (including other steel lintels)	0.00		No
Table K1 - Accredited	E3 Sill	9.20	0.04	Yes
Table K1 - Accredited	E4 Jamb	22.80	0.05	Yes
Table K1 - Accredited	E5 Ground floor	20.00	0.16	Yes
Table K1 - Accredited	E6 Intermediate floor within a dwelling	20.00	0.07	Yes
	E7 Intermediate floor between dwellings (in blocks of flats)	0.00		No
	E8 Balcony within a dwelling	0.00		No
Table K1 - Accredited	E9 Balcony between dwellings	0.00		No
	E10 Eaves (insulation at ceiling level)	20.00	0.06	No
	E11 Eaves (insulation at rafter level)	0.00		No
Table K1 - Accredited	E12 Gable (insulation at ceiling level)	0.00		No
	E13 Gable (insulation at rafter level)	0.00		No
	E14 Flat roof	0.00		No
	E15 Flat roof with parapet	0.00		No
Table K1 - Accredited	E16 Corner (normal)	10.00	0.09	Yes
	E17 Corner (inverted - internal area greater than external area)	0.00		No
Table K1 - Accredited	E18 Party wall between dwellings	10.00	0.06	Yes
Table K1 - Accredited	P1 Party wall - Ground floor	10.00	0.08	No
Table K1 - Accredited	P2 Party wall - Intermediate floor within a dwelling	10.00		No
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.00		No
Table K1 - Accredited	P4 Party wall - Roof (insulation at ceiling level)	10.00	0.12	No
	P5 Party wall - Roof (insulation at rafter level)	0.00		No

18.0 Pressure Testing	Yes
Designed q50	8.00
Property Tested ?	
As Built q50	
Same As Designed ?	

19.0 Mechanical Ventilation

Mechanical Ventilation System	No
Present	
Approved Installation	
Windows open in hot weather	Windows fully open
Cross ventilation possible	No
Night Ventilation	No
Air change rate	5.00
Mechanical Ventilation data Type	
Type	
MV Reference Number	
Configuration	
MVHR Duct Insulated	
Manufacturer SFP	
Duct Type	
MVHR Efficiency	
Wet Rooms	
Brand, Model	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Cooling System No

22.0 Lighting

Internal		
Total number of light fittings	12	
Total number of L.E.L. fittings	9	
Percentage of L.E.L. fittings	75.00	
External		
External lights fitted	No	
Light and motion sensors		
23.0 Electricity Tariff	Standard	
24.0 Heating Systems		
Main Heating 1	SAPTable	
Description		
Percentage of Heat	100.00	
Main Heating 2	None	
Description		
Percentage of Heat		
Community Heating		
Secondary Heating		
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery System	No	
1		
Waste Water Heat Recovery System	No	
2		
Solar Panel	No	
25.0 Main Heating 1		
Database Ref. No.		
Fuel Type		
Main Heating	Electricity PED Heat pump air-to-water	
TestMethod		
SAP Code	204	
Efficiency (SAP Table) %	250	
In Winter		
In Summer		
Model Name		
Manufacturer		
Controls	CHD Time and temperature zone control	
Delayed Start Stat	No	
Sap Code	2207	
Burner Control		
Boiler Compensator	None	
HETAS approved System		
Oil Pump Inside		
FI Case		
FI Water		
Flue Type		
Smoke Control Area		
Fan Assisted Flue		
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Electric CPSU Temperature		
Combi boiler type		
Combi keep hot type		
Combi store type		
27.0 Community Heating		
Space Community Heating		
Distribution Loss		
Distribution Loss Value		
Controls		
SAP Code		
Water Community Heating		
Distribution Loss		
Distribution Loss Value		
Charging Linked To Heat Use		
28.0 Secondary Heating		
Description		
SHS efficiency %		
SAP Code		
HETAS Approved System		
Smoke Control Area		
Test Method		
Manufacturer		
Model Name		
29.0 Water Heating	HWP From main heating 1	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	

Immersion Heater	Dual			
Summer Immersion				
Supplementary Immersion	Yes			
Immersion Only Heating Hot Water				
29.1 Flue Gas Heat Recovery System				
Database ID				
Brand Model				
Details				
29.2 Waste Water Heat Recovery System				
Total rooms with shower and/or bath				
30.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Foam			
Insulation Thickness	80			
Cylinder Volume	110			
Loss (kwh/day)				
Pipes insulation	Yes			
In Airing Cupboard				
31.0 Solar Panel				
Solar Panel Area				
Area Type				
Panel Type				
n0, a1, A/G ratio				
Orientation				
Elevation				
Overshading				
Solar Storage Volume				
Pump electrically powered				
Combined Cylinder				
32.0 Thermal Store	None			
Thermal Store Pipework	within a single casing			
33.0 Photovoltaic Unit	One Dwelling			
Apportioned kWh/Year				
PV Cells kW Peak	Orientation	Elevation	Overshading	
8	South	45°	None Or Little	
34.0 Wind Turbines				
Terrain Type	Urban			
Wind Turbines Count				
Apportioned Kwh/year				
Rotor Diameter				
Hub Height				
35.0 Small-scale Hydro				
Electricity Generated				
Description				
Apportioned kWh/Year				
Recommendations				
None				
Further measures to achieve even higher standards				
Solar water heating	£123	A 117	A 116	

Thermal Bridging

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Property Reference: SAP RATING

Issued on Date: 26.Mar.2013

Survey Reference: 001

Prop Type Ref: Detached House

Property: Detached House, Unit 1F, THe Milestone Centre, 75 Quarry Road, Carrickmore, Tyrone, BT79 9AL

SAP Rating: 113 A **CO2 Emissions (t/year):** -1.43 **DER:-12.43 Pass** **Reduction:** 138.0% **FEE:** 60.9 **ZC8:** 4.90
Environmental: 113 A **General Requirements Compliance:** Pass **TER:** 32.72 **HLP:** 1.37 **Energy cost:** £ -428

CfSH Results **Version:** **ENE1 Credits:** N/A **ENE2 Credits:** N/A **ENE7 Credits:** N/A **CfSH Level:** N/A

Surveyor: Conor Loughran, Tel: 028 807 60819 **Surveyor ID:** 7181-0001

Address: Aughnagreggan Rd, Carrickmore, Tyrone, BT79 9JZ

Client: Elmhurst

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 4.04r04

SAP version: SAP 2009, Regs Region: Northern Ireland (NI Technical Booklet F1 2011), Calculation Type: New Dwelling As Designed

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Table K1 - Accredited	0.500	9.20	4.60	
External wall	E3 Sill	Table K1 - Accredited	0.040	9.20	0.37	
External wall	E4 Jamb	Table K1 - Accredited	0.050	22.80	1.14	
External wall	E5 Ground floor	Table K1 - Accredited	0.160	20.00	3.20	
External wall	E6 Intermediate floor within a dwelling	Table K1 - Accredited	0.070	20.00	1.40	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Accredited	0.060	20.00	1.20	
External wall	E16 Corner (normal)	Table K1 - Accredited	0.090	10.00	0.90	
Party wall	E18 Party wall between dwellings	Table K1 - Accredited	0.060	10.00	0.60	
Party wall	P1 Party wall - Ground floor	Table K1 - Accredited	0.080	10.00	0.80	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Accredited	0.000	10.00	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Accredited	0.120	10.00	1.20	

Total W/mK: 15.41
Y-Value W/m2K: 0.077