

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:

Stroma Number:

Software Name: Stroma FSAP 2012

Software Version:

Version: 1.0.5.41

Property Address: HONE House Anon

Address : House , 1 Main Street, CH11 XYZ

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	48.58	(1a) x	2.75	(2a) =	133.6
First floor	43.22	(1b) x	2.65	(2b) =	114.53
Second floor	43.22	(1c) x	2.44	(2c) =	105.46
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135.02	(4)			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	353.58

2. Ventilation rate:

	main heating	+	secondary heating	+	other	=	total		m ³ per hour
Number of chimneys	0		0		0	=	0	x 40 =	0
Number of open flues	0		0		0	=	0	x 20 =	0
Number of intermittent fans							0	x 10 =	0
Number of passive vents							0	x 10 =	0
Number of flueless gas fires							0	x 40 =	0

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 $0.25 - [0.2 \times (14) \div 100] =$ 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 0.600000023841858 (17)

If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) 0.03 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered 0 (19)

Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)

Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.03 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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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
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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
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

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

0.5	(23b)
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If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =

75.65	(23c)
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a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]

(24a)m=	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	(24a)
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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)
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c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
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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)
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Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	(25)
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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			3.74	x 1.2	= 4.488		(26)
Windows Type 1			1.64	x 1/[1/(0.8)+0.04]	= 1.27		(27)
Windows Type 2			1.64	x 1/[1/(0.8)+0.04]	= 1.27		(27)
Windows Type 3			1.64	x 1/[1/(0.8)+0.04]	= 1.27		(27)
Windows Type 4			1.64	x 1/[1/(0.8)+0.04]	= 1.27		(27)
Windows Type 5			9.84	x 1/[1/(0.7)+0.04]	= 6.7		(27)
Windows Type 6			1.5	x 1/[1/(0.8)+0.04]	= 1.16		(27)
Windows Type 7			1.64	x 1/[1/(0.8)+0.04]	= 1.27		(27)
Windows Type 8			0.72	x 1/[1/(0.8)+0.04]	= 0.56		(27)
Windows Type 9			1.75	x 1/[1/(0.7)+0.04]	= 1.19		(27)
Windows Type 10			2.24	x 1/[1/(0.8)+0.04]	= 1.74		(27)
Windows Type 11			0.84	x 1/[1/(0.8)+0.04]	= 0.65		(27)
Windows Type 12			2.24	x 1/[1/(0.8)+0.04]	= 1.74		(27)
Windows Type 13			0.72	x 1/[1/(0.8)+0.04]	= 0.56		(27)
Windows Type 14			0.72	x 1/[1/(0.8)+0.04]	= 0.56		(27)
Windows Type 15			1.35	x 1/[1/(0.8)+0.04]	= 1.05		(27)
Windows Type 16			1.35	x 1/[1/(0.8)+0.04]	= 1.05		(27)

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Windows Type 17			2.1	$\times 1/[1/(0.8) + 0.04] =$	1.63			(27)
Windows Type 18			0.84	$\times 1/[1/(0.8) + 0.04] =$	0.65			(27)
Windows Type 19			2.1	$\times 1/[1/(0.8) + 0.04] =$	1.63			(27)
Windows Type 20			0.72	$\times 1/[1/(0.8) + 0.04] =$	0.56			(27)
Windows Type 21			0.72	$\times 1/[1/(0.8) + 0.04] =$	0.56			(27)
Rooflights			0.72	$\times 1/[1/(0.8) + 0.04] =$	0.576			(27b)
Floor			48.58	\times	0.17	$=$	8.2586	(28)
Walls	200.77	41.69	159.08	\times	0.11	$=$	17.5	(29)
Roof Type1	16.69	0.72	15.97	\times	0.11	$=$	1.76	(30)
Roof Type2	26.56	0	26.56	\times	0.11	$=$	2.92	(30)
Roof Type3	2.62	0	2.62	\times	0.11	$=$	0.29	(30)
Total area of elements, m ²			295.22					(31)

* for windows and roof windows, use effective window U-value calculated using formula $1/[1/(U\text{-value})+0.04]$ 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) =	64.1	(33)
Heat capacity Cm = S(A x k)	((28)...(30) + (32) + (32a)...(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K	Indicative Value: Medium	250	(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		26.98	(36)
if details of thermal bridging are not known (36) = 0.05 x (31)			
Total fabric heat loss	(33) + (36) =	91.08	(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=		18.67	18.58	18.49	18.06	17.97	17.53	17.53	17.44	17.71	17.97	18.14	18.32	(38)

Heat transfer coefficient, W/K	(39)m = (37) + (38)m														
(39)m=		109.75	109.66	109.57	109.13	109.05	108.61	108.61	108.52	108.78	109.05	109.22	109.4		
		Average = Sum(39) _{1...12} / 12 =												109.11	(39)

Heat loss parameter (HLP), W/m ² K	(40)m = (39)m ÷ (4)														
(40)m=		0.81	0.81	0.81	0.81	0.81	0.8	0.8	0.8	0.81	0.81	0.81	0.81		
		Average = Sum(40) _{1...12} / 12 =												0.81	(40)

Number of days in month (Table 1a)														
(41)m=		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(41)
		31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N		2.91	(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		108.67	(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)			

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)															
(44)m=		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		119.54	115.19	110.85	106.5	102.15	97.81	97.81	102.15	106.5	110.85	115.19	119.54		
		Total = Sum(44) _{1...12} =												1304.08	(44)

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

(45)m=	177.28	155.05	159.99	139.49	133.84	115.49	107.02	122.81	124.28	144.83	158.1	171.68	
Total = Sum(45) _{1...12} =												1709.86	(45)

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

(46)m=	26.59	23.26	24	20.92	20.08	17.32	16.05	18.42	18.64	21.72	23.71	25.75	
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Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	450	(47)
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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):	1.92	(48)
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Temperature factor from Table 2b	0.6	(49)
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Energy lost from water storage, kWh/year	(48) x (49) =	1.15	(50)
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b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
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If community heating see section 4.3

Volume factor from Table 2a	0	(52)
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Temperature factor from Table 2b	0	(53)
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Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
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Enter (50) or (54) in (55)	1.15	(55)
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Water storage loss calculated for each month $((56)m = (55) \times (41)m$

(56)m=	35.71	32.26	35.71	34.56	35.71	34.56	35.71	35.71	34.56	35.71	34.56	35.71	
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If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H

(57)m=	17.86	16.13	17.86	17.28	17.86	17.28	17.86	17.86	17.28	17.86	17.28	17.86	
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Primary circuit loss (annual) from Table 3	0	(58)
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Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$

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

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	
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Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	
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Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$

(62)m=	195.13	171.17	177.85	156.77	151.7	132.77	124.88	140.67	141.56	162.69	175.38	189.54	
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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=	-30.13	-54.46	-102.72	-150.32	-195.36	-195.7	-191.61	-161.22	-117.34	-72.43	-36.59	-24.63	
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Output from water heater

(64)m=	165	116.72	75.13	6.45	0	0	0	0	24.22	90.26	138.78	164.91	
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Output from water heater (annual)_{1...12} = 781.46 (64)

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

(65)m=	73.23	64.46	67.48	60.2	58.79	52.23	49.87	55.12	55.15	62.44	66.39	71.37	
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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
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(66)m=	145.35	145.35	145.35	145.35	145.35	145.35	145.35	145.35	145.35	145.35	145.35	145.35	(66)
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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	27.07	24.05	19.56	14.8	11.07	9.34	10.1	13.12	17.61	22.36	26.1	27.83	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	303.67	306.83	298.89	281.98	260.64	240.58	227.18	224.03	231.97	248.88	270.22	290.28	(68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	(69)
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Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
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Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)
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Water heating gains (Table 5)

(72)m=	98.43	95.92	90.7	83.62	79.01	72.54	67.03	74.08	76.59	83.93	92.21	95.93	(72)
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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	498.78	496.39	478.75	450	420.33	392.07	373.91	380.84	395.78	424.77	458.13	483.63	(73)
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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	x	Area m ²	x	Flux Table 6a	x	g_ Table 6b	x	FF Table 6c	=	Gains (W)			
North	0.9x		0.77	x	1.5	x	10.63	x	0.68	x	0.8	=	6.01	(74)
North	0.9x		0.77	x	1.5	x	20.32	x	0.68	x	0.8	=	11.49	(74)
North	0.9x		0.77	x	1.5	x	34.53	x	0.68	x	0.8	=	19.53	(74)
North	0.9x		0.77	x	1.5	x	55.46	x	0.68	x	0.8	=	31.36	(74)
North	0.9x		0.77	x	1.5	x	74.72	x	0.68	x	0.8	=	42.25	(74)
North	0.9x		0.77	x	1.5	x	79.99	x	0.68	x	0.8	=	45.23	(74)
North	0.9x		0.77	x	1.5	x	74.68	x	0.68	x	0.8	=	42.23	(74)
North	0.9x		0.77	x	1.5	x	59.25	x	0.68	x	0.8	=	33.5	(74)
North	0.9x		0.77	x	1.5	x	41.52	x	0.68	x	0.8	=	23.48	(74)
North	0.9x		0.77	x	1.5	x	24.19	x	0.68	x	0.8	=	13.68	(74)
North	0.9x		0.77	x	1.5	x	13.12	x	0.68	x	0.8	=	7.42	(74)
North	0.9x		0.77	x	1.5	x	8.86	x	0.68	x	0.8	=	5.01	(74)
East	0.9x		0.77	x	1.64	x	19.64	x	0.68	x	0.8	=	12.14	(76)
East	0.9x		0.77	x	1.64	x	19.64	x	0.68	x	0.8	=	12.14	(76)
East	0.9x		0.77	x	1.64	x	19.64	x	0.68	x	0.8	=	12.14	(76)
East	0.9x		0.77	x	1.64	x	19.64	x	0.68	x	0.8	=	12.14	(76)
East	0.9x		0.77	x	1.64	x	19.64	x	0.68	x	0.8	=	12.14	(76)
East	0.9x		0.77	x	0.84	x	19.64	x	0.68	x	0.8	=	6.22	(76)
East	0.9x		0.77	x	2.24	x	19.64	x	0.68	x	0.8	=	16.59	(76)
East	0.9x		0.77	x	2.1	x	19.64	x	0.68	x	0.8	=	15.55	(76)
East	0.9x		0.77	x	0.84	x	19.64	x	0.68	x	0.8	=	6.22	(76)

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East	0.9x	0.77	x	2.1	x	19.64	x	0.68	x	0.8	=	15.55	(76)
East	0.9x	0.77	x	1.64	x	38.42	x	0.68	x	0.8	=	23.75	(76)
East	0.9x	0.77	x	1.64	x	38.42	x	0.68	x	0.8	=	23.75	(76)
East	0.9x	0.77	x	1.64	x	38.42	x	0.68	x	0.8	=	23.75	(76)
East	0.9x	0.77	x	1.64	x	38.42	x	0.68	x	0.8	=	23.75	(76)
East	0.9x	0.77	x	1.64	x	38.42	x	0.68	x	0.8	=	23.75	(76)
East	0.9x	0.77	x	0.84	x	38.42	x	0.68	x	0.8	=	12.17	(76)
East	0.9x	0.77	x	2.24	x	38.42	x	0.68	x	0.8	=	32.44	(76)
East	0.9x	0.77	x	2.1	x	38.42	x	0.68	x	0.8	=	30.42	(76)
East	0.9x	0.77	x	0.84	x	38.42	x	0.68	x	0.8	=	12.17	(76)
East	0.9x	0.77	x	2.1	x	38.42	x	0.68	x	0.8	=	30.42	(76)
East	0.9x	0.77	x	1.64	x	63.27	x	0.68	x	0.8	=	39.12	(76)
East	0.9x	0.77	x	1.64	x	63.27	x	0.68	x	0.8	=	39.12	(76)
East	0.9x	0.77	x	1.64	x	63.27	x	0.68	x	0.8	=	39.12	(76)
East	0.9x	0.77	x	1.64	x	63.27	x	0.68	x	0.8	=	39.12	(76)
East	0.9x	0.77	x	1.64	x	63.27	x	0.68	x	0.8	=	39.12	(76)
East	0.9x	0.77	x	0.84	x	63.27	x	0.68	x	0.8	=	20.04	(76)
East	0.9x	0.77	x	2.24	x	63.27	x	0.68	x	0.8	=	53.43	(76)
East	0.9x	0.77	x	2.1	x	63.27	x	0.68	x	0.8	=	50.09	(76)
East	0.9x	0.77	x	0.84	x	63.27	x	0.68	x	0.8	=	20.04	(76)
East	0.9x	0.77	x	2.1	x	63.27	x	0.68	x	0.8	=	50.09	(76)
East	0.9x	0.77	x	1.64	x	92.28	x	0.68	x	0.8	=	57.05	(76)
East	0.9x	0.77	x	1.64	x	92.28	x	0.68	x	0.8	=	57.05	(76)
East	0.9x	0.77	x	1.64	x	92.28	x	0.68	x	0.8	=	57.05	(76)
East	0.9x	0.77	x	1.64	x	92.28	x	0.68	x	0.8	=	57.05	(76)
East	0.9x	0.77	x	1.64	x	92.28	x	0.68	x	0.8	=	57.05	(76)
East	0.9x	0.77	x	0.84	x	92.28	x	0.68	x	0.8	=	29.22	(76)
East	0.9x	0.77	x	2.24	x	92.28	x	0.68	x	0.8	=	77.93	(76)
East	0.9x	0.77	x	2.1	x	92.28	x	0.68	x	0.8	=	73.06	(76)
East	0.9x	0.77	x	0.84	x	92.28	x	0.68	x	0.8	=	29.22	(76)
East	0.9x	0.77	x	2.1	x	92.28	x	0.68	x	0.8	=	73.06	(76)
East	0.9x	0.77	x	1.64	x	113.09	x	0.68	x	0.8	=	69.92	(76)
East	0.9x	0.77	x	1.64	x	113.09	x	0.68	x	0.8	=	69.92	(76)
East	0.9x	0.77	x	1.64	x	113.09	x	0.68	x	0.8	=	69.92	(76)
East	0.9x	0.77	x	1.64	x	113.09	x	0.68	x	0.8	=	69.92	(76)
East	0.9x	0.77	x	1.64	x	113.09	x	0.68	x	0.8	=	69.92	(76)
East	0.9x	0.77	x	0.84	x	113.09	x	0.68	x	0.8	=	35.81	(76)
East	0.9x	0.77	x	2.24	x	113.09	x	0.68	x	0.8	=	95.5	(76)
East	0.9x	0.77	x	2.1	x	113.09	x	0.68	x	0.8	=	89.53	(76)
East	0.9x	0.77	x	0.84	x	113.09	x	0.68	x	0.8	=	35.81	(76)
East	0.9x	0.77	x	2.1	x	113.09	x	0.68	x	0.8	=	89.53	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.64	x	115.77	x	0.68	x	0.8	=	71.58	(76)
East	0.9x	0.77	x	1.64	x	115.77	x	0.68	x	0.8	=	71.58	(76)
East	0.9x	0.77	x	1.64	x	115.77	x	0.68	x	0.8	=	71.58	(76)
East	0.9x	0.77	x	1.64	x	115.77	x	0.68	x	0.8	=	71.58	(76)
East	0.9x	0.77	x	1.64	x	115.77	x	0.68	x	0.8	=	71.58	(76)
East	0.9x	0.77	x	0.84	x	115.77	x	0.68	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	2.24	x	115.77	x	0.68	x	0.8	=	97.76	(76)
East	0.9x	0.77	x	2.1	x	115.77	x	0.68	x	0.8	=	91.65	(76)
East	0.9x	0.77	x	0.84	x	115.77	x	0.68	x	0.8	=	36.66	(76)
East	0.9x	0.77	x	2.1	x	115.77	x	0.68	x	0.8	=	91.65	(76)
East	0.9x	0.77	x	1.64	x	110.22	x	0.68	x	0.8	=	68.14	(76)
East	0.9x	0.77	x	1.64	x	110.22	x	0.68	x	0.8	=	68.14	(76)
East	0.9x	0.77	x	1.64	x	110.22	x	0.68	x	0.8	=	68.14	(76)
East	0.9x	0.77	x	1.64	x	110.22	x	0.68	x	0.8	=	68.14	(76)
East	0.9x	0.77	x	0.84	x	110.22	x	0.68	x	0.8	=	34.9	(76)
East	0.9x	0.77	x	2.24	x	110.22	x	0.68	x	0.8	=	93.08	(76)
East	0.9x	0.77	x	2.1	x	110.22	x	0.68	x	0.8	=	87.26	(76)
East	0.9x	0.77	x	0.84	x	110.22	x	0.68	x	0.8	=	34.9	(76)
East	0.9x	0.77	x	2.1	x	110.22	x	0.68	x	0.8	=	87.26	(76)
East	0.9x	0.77	x	1.64	x	94.68	x	0.68	x	0.8	=	58.53	(76)
East	0.9x	0.77	x	1.64	x	94.68	x	0.68	x	0.8	=	58.53	(76)
East	0.9x	0.77	x	1.64	x	94.68	x	0.68	x	0.8	=	58.53	(76)
East	0.9x	0.77	x	1.64	x	94.68	x	0.68	x	0.8	=	58.53	(76)
East	0.9x	0.77	x	1.64	x	94.68	x	0.68	x	0.8	=	58.53	(76)
East	0.9x	0.77	x	0.84	x	94.68	x	0.68	x	0.8	=	29.98	(76)
East	0.9x	0.77	x	2.24	x	94.68	x	0.68	x	0.8	=	79.95	(76)
East	0.9x	0.77	x	2.1	x	94.68	x	0.68	x	0.8	=	74.95	(76)
East	0.9x	0.77	x	0.84	x	94.68	x	0.68	x	0.8	=	29.98	(76)
East	0.9x	0.77	x	2.1	x	94.68	x	0.68	x	0.8	=	74.95	(76)
East	0.9x	0.77	x	1.64	x	73.59	x	0.68	x	0.8	=	45.5	(76)
East	0.9x	0.77	x	1.64	x	73.59	x	0.68	x	0.8	=	45.5	(76)
East	0.9x	0.77	x	1.64	x	73.59	x	0.68	x	0.8	=	45.5	(76)
East	0.9x	0.77	x	1.64	x	73.59	x	0.68	x	0.8	=	45.5	(76)
East	0.9x	0.77	x	0.84	x	73.59	x	0.68	x	0.8	=	23.3	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.68	x	0.8	=	62.14	(76)
East	0.9x	0.77	x	2.1	x	73.59	x	0.68	x	0.8	=	58.26	(76)
East	0.9x	0.77	x	0.84	x	73.59	x	0.68	x	0.8	=	23.3	(76)
East	0.9x	0.77	x	2.1	x	73.59	x	0.68	x	0.8	=	58.26	(76)
East	0.9x	0.77	x	1.64	x	45.59	x	0.68	x	0.8	=	28.19	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.64	x	45.59	x	0.68	x	0.8	=	28.19	(76)
East	0.9x	0.77	x	1.64	x	45.59	x	0.68	x	0.8	=	28.19	(76)
East	0.9x	0.77	x	1.64	x	45.59	x	0.68	x	0.8	=	28.19	(76)
East	0.9x	0.77	x	1.64	x	45.59	x	0.68	x	0.8	=	28.19	(76)
East	0.9x	0.77	x	0.84	x	45.59	x	0.68	x	0.8	=	14.44	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.68	x	0.8	=	38.5	(76)
East	0.9x	0.77	x	2.1	x	45.59	x	0.68	x	0.8	=	36.09	(76)
East	0.9x	0.77	x	0.84	x	45.59	x	0.68	x	0.8	=	14.44	(76)
East	0.9x	0.77	x	2.1	x	45.59	x	0.68	x	0.8	=	36.09	(76)
East	0.9x	0.77	x	1.64	x	24.49	x	0.68	x	0.8	=	15.14	(76)
East	0.9x	0.77	x	1.64	x	24.49	x	0.68	x	0.8	=	15.14	(76)
East	0.9x	0.77	x	1.64	x	24.49	x	0.68	x	0.8	=	15.14	(76)
East	0.9x	0.77	x	1.64	x	24.49	x	0.68	x	0.8	=	15.14	(76)
East	0.9x	0.77	x	1.64	x	24.49	x	0.68	x	0.8	=	15.14	(76)
East	0.9x	0.77	x	0.84	x	24.49	x	0.68	x	0.8	=	7.76	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.68	x	0.8	=	20.68	(76)
East	0.9x	0.77	x	2.1	x	24.49	x	0.68	x	0.8	=	19.39	(76)
East	0.9x	0.77	x	0.84	x	24.49	x	0.68	x	0.8	=	7.76	(76)
East	0.9x	0.77	x	2.1	x	24.49	x	0.68	x	0.8	=	19.39	(76)
East	0.9x	0.77	x	1.64	x	16.15	x	0.68	x	0.8	=	9.99	(76)
East	0.9x	0.77	x	1.64	x	16.15	x	0.68	x	0.8	=	9.99	(76)
East	0.9x	0.77	x	1.64	x	16.15	x	0.68	x	0.8	=	9.99	(76)
East	0.9x	0.77	x	1.64	x	16.15	x	0.68	x	0.8	=	9.99	(76)
East	0.9x	0.77	x	1.64	x	16.15	x	0.68	x	0.8	=	9.99	(76)
East	0.9x	0.77	x	0.84	x	16.15	x	0.68	x	0.8	=	5.11	(76)
East	0.9x	0.77	x	2.24	x	16.15	x	0.68	x	0.8	=	13.64	(76)
East	0.9x	0.77	x	2.1	x	16.15	x	0.68	x	0.8	=	12.79	(76)
East	0.9x	0.77	x	0.84	x	16.15	x	0.68	x	0.8	=	5.11	(76)
East	0.9x	0.77	x	2.1	x	16.15	x	0.68	x	0.8	=	12.79	(76)
South	0.9x	0.77	x	9.84	x	46.75	x	0.68	x	0.8	=	173.43	(78)
South	0.9x	0.77	x	0.72	x	46.75	x	0.68	x	0.8	=	12.69	(78)
South	0.9x	0.77	x	1.75	x	46.75	x	0.68	x	0.8	=	30.84	(78)
South	0.9x	0.77	x	2.24	x	46.75	x	0.68	x	0.8	=	39.48	(78)
South	0.9x	0.77	x	1.35	x	46.75	x	0.68	x	0.8	=	23.79	(78)
South	0.9x	0.77	x	1.35	x	46.75	x	0.68	x	0.8	=	23.79	(78)
South	0.9x	0.77	x	9.84	x	76.57	x	0.68	x	0.8	=	284.04	(78)
South	0.9x	0.77	x	0.72	x	76.57	x	0.68	x	0.8	=	20.78	(78)
South	0.9x	0.77	x	1.75	x	76.57	x	0.68	x	0.8	=	50.51	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.68	x	0.8	=	64.66	(78)
South	0.9x	0.77	x	1.35	x	76.57	x	0.68	x	0.8	=	38.97	(78)
South	0.9x	0.77	x	1.35	x	76.57	x	0.68	x	0.8	=	38.97	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	9.84	x	97.53	x	0.68	x	0.8	=	361.81	(78)
South	0.9x	0.77	x	0.72	x	97.53	x	0.68	x	0.8	=	26.47	(78)
South	0.9x	0.77	x	1.75	x	97.53	x	0.68	x	0.8	=	64.35	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.68	x	0.8	=	82.36	(78)
South	0.9x	0.77	x	1.35	x	97.53	x	0.68	x	0.8	=	49.64	(78)
South	0.9x	0.77	x	1.35	x	97.53	x	0.68	x	0.8	=	49.64	(78)
South	0.9x	0.77	x	9.84	x	110.23	x	0.68	x	0.8	=	408.93	(78)
South	0.9x	0.77	x	0.72	x	110.23	x	0.68	x	0.8	=	29.92	(78)
South	0.9x	0.77	x	1.75	x	110.23	x	0.68	x	0.8	=	72.73	(78)
South	0.9x	0.77	x	2.24	x	110.23	x	0.68	x	0.8	=	93.09	(78)
South	0.9x	0.77	x	1.35	x	110.23	x	0.68	x	0.8	=	56.1	(78)
South	0.9x	0.77	x	1.35	x	110.23	x	0.68	x	0.8	=	56.1	(78)
South	0.9x	0.77	x	9.84	x	114.87	x	0.68	x	0.8	=	426.13	(78)
South	0.9x	0.77	x	0.72	x	114.87	x	0.68	x	0.8	=	31.18	(78)
South	0.9x	0.77	x	1.75	x	114.87	x	0.68	x	0.8	=	75.78	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.68	x	0.8	=	97	(78)
South	0.9x	0.77	x	1.35	x	114.87	x	0.68	x	0.8	=	58.46	(78)
South	0.9x	0.77	x	1.35	x	114.87	x	0.68	x	0.8	=	58.46	(78)
South	0.9x	0.77	x	9.84	x	110.55	x	0.68	x	0.8	=	410.09	(78)
South	0.9x	0.77	x	0.72	x	110.55	x	0.68	x	0.8	=	30.01	(78)
South	0.9x	0.77	x	1.75	x	110.55	x	0.68	x	0.8	=	72.93	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.68	x	0.8	=	93.35	(78)
South	0.9x	0.77	x	1.35	x	110.55	x	0.68	x	0.8	=	56.26	(78)
South	0.9x	0.77	x	1.35	x	110.55	x	0.68	x	0.8	=	56.26	(78)
South	0.9x	0.77	x	9.84	x	108.01	x	0.68	x	0.8	=	400.68	(78)
South	0.9x	0.77	x	0.72	x	108.01	x	0.68	x	0.8	=	29.32	(78)
South	0.9x	0.77	x	1.75	x	108.01	x	0.68	x	0.8	=	71.26	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.68	x	0.8	=	91.21	(78)
South	0.9x	0.77	x	1.35	x	108.01	x	0.68	x	0.8	=	54.97	(78)
South	0.9x	0.77	x	1.35	x	108.01	x	0.68	x	0.8	=	54.97	(78)
South	0.9x	0.77	x	9.84	x	104.89	x	0.68	x	0.8	=	389.12	(78)
South	0.9x	0.77	x	0.72	x	104.89	x	0.68	x	0.8	=	28.47	(78)
South	0.9x	0.77	x	1.75	x	104.89	x	0.68	x	0.8	=	69.2	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.68	x	0.8	=	88.58	(78)
South	0.9x	0.77	x	1.35	x	104.89	x	0.68	x	0.8	=	53.38	(78)
South	0.9x	0.77	x	1.35	x	104.89	x	0.68	x	0.8	=	53.38	(78)
South	0.9x	0.77	x	9.84	x	101.89	x	0.68	x	0.8	=	377.96	(78)
South	0.9x	0.77	x	0.72	x	101.89	x	0.68	x	0.8	=	27.66	(78)
South	0.9x	0.77	x	1.75	x	101.89	x	0.68	x	0.8	=	67.22	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.68	x	0.8	=	86.04	(78)
South	0.9x	0.77	x	1.35	x	101.89	x	0.68	x	0.8	=	51.85	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.35	x	101.89	x	0.68	x	0.8	=	51.85	(78)
South	0.9x	0.77	x	9.84	x	82.59	x	0.68	x	0.8	=	306.36	(78)
South	0.9x	0.77	x	0.72	x	82.59	x	0.68	x	0.8	=	22.42	(78)
South	0.9x	0.77	x	1.75	x	82.59	x	0.68	x	0.8	=	54.48	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.68	x	0.8	=	69.74	(78)
South	0.9x	0.77	x	1.35	x	82.59	x	0.68	x	0.8	=	42.03	(78)
South	0.9x	0.77	x	1.35	x	82.59	x	0.68	x	0.8	=	42.03	(78)
South	0.9x	0.77	x	9.84	x	55.42	x	0.68	x	0.8	=	205.58	(78)
South	0.9x	0.77	x	0.72	x	55.42	x	0.68	x	0.8	=	15.04	(78)
South	0.9x	0.77	x	1.75	x	55.42	x	0.68	x	0.8	=	36.56	(78)
South	0.9x	0.77	x	2.24	x	55.42	x	0.68	x	0.8	=	46.8	(78)
South	0.9x	0.77	x	1.35	x	55.42	x	0.68	x	0.8	=	28.2	(78)
South	0.9x	0.77	x	1.35	x	55.42	x	0.68	x	0.8	=	28.2	(78)
South	0.9x	0.77	x	9.84	x	40.4	x	0.68	x	0.8	=	149.86	(78)
South	0.9x	0.77	x	0.72	x	40.4	x	0.68	x	0.8	=	10.97	(78)
South	0.9x	0.77	x	1.75	x	40.4	x	0.68	x	0.8	=	26.65	(78)
South	0.9x	0.77	x	2.24	x	40.4	x	0.68	x	0.8	=	34.11	(78)
South	0.9x	0.77	x	1.35	x	40.4	x	0.68	x	0.8	=	20.56	(78)
South	0.9x	0.77	x	1.35	x	40.4	x	0.68	x	0.8	=	20.56	(78)
West	0.9x	0.77	x	0.72	x	19.64	x	0.68	x	0.8	=	5.33	(80)
West	0.9x	0.77	x	0.72	x	19.64	x	0.68	x	0.8	=	5.33	(80)
West	0.9x	0.77	x	0.72	x	19.64	x	0.68	x	0.8	=	5.33	(80)
West	0.9x	0.77	x	0.72	x	19.64	x	0.68	x	0.8	=	5.33	(80)
West	0.9x	0.77	x	0.72	x	38.42	x	0.68	x	0.8	=	10.43	(80)
West	0.9x	0.77	x	0.72	x	38.42	x	0.68	x	0.8	=	10.43	(80)
West	0.9x	0.77	x	0.72	x	38.42	x	0.68	x	0.8	=	10.43	(80)
West	0.9x	0.77	x	0.72	x	63.27	x	0.68	x	0.8	=	17.17	(80)
West	0.9x	0.77	x	0.72	x	63.27	x	0.68	x	0.8	=	17.17	(80)
West	0.9x	0.77	x	0.72	x	63.27	x	0.68	x	0.8	=	17.17	(80)
West	0.9x	0.77	x	0.72	x	63.27	x	0.68	x	0.8	=	17.17	(80)
West	0.9x	0.77	x	0.72	x	92.28	x	0.68	x	0.8	=	25.05	(80)
West	0.9x	0.77	x	0.72	x	92.28	x	0.68	x	0.8	=	25.05	(80)
West	0.9x	0.77	x	0.72	x	92.28	x	0.68	x	0.8	=	25.05	(80)
West	0.9x	0.77	x	0.72	x	92.28	x	0.68	x	0.8	=	25.05	(80)
West	0.9x	0.77	x	0.72	x	113.09	x	0.68	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	0.72	x	113.09	x	0.68	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	0.72	x	113.09	x	0.68	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	0.72	x	113.09	x	0.68	x	0.8	=	30.7	(80)
West	0.9x	0.77	x	0.72	x	115.77	x	0.68	x	0.8	=	31.42	(80)
West	0.9x	0.77	x	0.72	x	115.77	x	0.68	x	0.8	=	31.42	(80)

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West	0.9x	0.77	x	0.72	x	115.77	x	0.68	x	0.8	=	31.42	(80)
West	0.9x	0.77	x	0.72	x	115.77	x	0.68	x	0.8	=	31.42	(80)
West	0.9x	0.77	x	0.72	x	110.22	x	0.68	x	0.8	=	29.92	(80)
West	0.9x	0.77	x	0.72	x	110.22	x	0.68	x	0.8	=	29.92	(80)
West	0.9x	0.77	x	0.72	x	110.22	x	0.68	x	0.8	=	29.92	(80)
West	0.9x	0.77	x	0.72	x	94.68	x	0.68	x	0.8	=	25.7	(80)
West	0.9x	0.77	x	0.72	x	94.68	x	0.68	x	0.8	=	25.7	(80)
West	0.9x	0.77	x	0.72	x	94.68	x	0.68	x	0.8	=	25.7	(80)
West	0.9x	0.77	x	0.72	x	94.68	x	0.68	x	0.8	=	25.7	(80)
West	0.9x	0.77	x	0.72	x	73.59	x	0.68	x	0.8	=	19.97	(80)
West	0.9x	0.77	x	0.72	x	73.59	x	0.68	x	0.8	=	19.97	(80)
West	0.9x	0.77	x	0.72	x	73.59	x	0.68	x	0.8	=	19.97	(80)
West	0.9x	0.77	x	0.72	x	73.59	x	0.68	x	0.8	=	19.97	(80)
West	0.9x	0.77	x	0.72	x	45.59	x	0.68	x	0.8	=	12.37	(80)
West	0.9x	0.77	x	0.72	x	45.59	x	0.68	x	0.8	=	12.37	(80)
West	0.9x	0.77	x	0.72	x	45.59	x	0.68	x	0.8	=	12.37	(80)
West	0.9x	0.77	x	0.72	x	45.59	x	0.68	x	0.8	=	12.37	(80)
West	0.9x	0.77	x	0.72	x	24.49	x	0.68	x	0.8	=	6.65	(80)
West	0.9x	0.77	x	0.72	x	24.49	x	0.68	x	0.8	=	6.65	(80)
West	0.9x	0.77	x	0.72	x	24.49	x	0.68	x	0.8	=	6.65	(80)
West	0.9x	0.77	x	0.72	x	24.49	x	0.68	x	0.8	=	6.65	(80)
West	0.9x	0.77	x	0.72	x	16.15	x	0.68	x	0.8	=	4.38	(80)
West	0.9x	0.77	x	0.72	x	16.15	x	0.68	x	0.8	=	4.38	(80)
West	0.9x	0.77	x	0.72	x	16.15	x	0.68	x	0.8	=	4.38	(80)
West	0.9x	0.77	x	0.72	x	16.15	x	0.68	x	0.8	=	4.38	(80)
Rooflights	0.9x	1	x	0.72	x	15.3	x	0.68	x	0.8	=	5.39	(82)
Rooflights	0.9x	1	x	0.72	x	28.48	x	0.68	x	0.8	=	10.04	(82)
Rooflights	0.9x	1	x	0.72	x	50.24	x	0.68	x	0.8	=	17.71	(82)
Rooflights	0.9x	1	x	0.72	x	89.03	x	0.68	x	0.8	=	31.38	(82)
Rooflights	0.9x	1	x	0.72	x	129.88	x	0.68	x	0.8	=	45.79	(82)
Rooflights	0.9x	1	x	0.72	x	143.74	x	0.68	x	0.8	=	50.67	(82)
Rooflights	0.9x	1	x	0.72	x	132.31	x	0.68	x	0.8	=	46.64	(82)
Rooflights	0.9x	1	x	0.72	x	98.56	x	0.68	x	0.8	=	34.74	(82)
Rooflights	0.9x	1	x	0.72	x	62.62	x	0.68	x	0.8	=	22.08	(82)
Rooflights	0.9x	1	x	0.72	x	34.05	x	0.68	x	0.8	=	12	(82)
Rooflights	0.9x	1	x	0.72	x	18.64	x	0.68	x	0.8	=	6.57	(82)
Rooflights	0.9x	1	x	0.72	x	12.94	x	0.68	x	0.8	=	4.56	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m= 457.6 797.56 1129.5 1447.56 1653.65 1652.78 1589.07 1435.68 1240.78 892.73 551.63 389.2 (83)

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

(84)m= 956.38 1293.95 1608.24 1897.57 2073.97 2044.85 1962.98 1816.52 1636.57 1317.5 1009.77 872.83 (84)

DER WorkSheet: New dwelling design stage

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	0.96	0.86	0.68	0.49	0.34	0.24	0.27	0.46	0.8	0.98	1	(86)

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

(87)m=	20.47	20.67	20.85	20.94	20.96	20.96	20.96	20.96	20.96	20.91	20.66	20.42	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.24	20.24	20.24	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.24	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.95	0.84	0.64	0.45	0.3	0.2	0.23	0.41	0.76	0.97	1	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.53	19.82	20.06	20.17	20.19	20.19	20.19	20.19	20.19	20.14	19.81	19.46	(90)
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fLA = Living area ÷ (4) = 0.15 (91)

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

(92)m=	19.67	19.95	20.18	20.28	20.3	20.31	20.31	20.31	20.31	20.26	19.94	19.61	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.67	19.95	20.18	20.28	20.3	20.31	20.31	20.31	20.31	20.26	19.94	19.61	(93)
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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
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Utilisation factor for gains, hm:

(94)m=	0.99	0.95	0.84	0.64	0.45	0.3	0.21	0.23	0.41	0.76	0.97	0.99	(94)
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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	947	1229.25	1347.03	1216.59	935.69	619.77	402.69	424.11	674.09	996.4	976.09	867.73	(95)
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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)
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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1687.22	1650.22	1498.76	1242.39	938.15	619.9	402.7	424.13	675.1	1053.29	1402.87	1685.72	(97)
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	550.73	282.9	112.89	18.58	1.84	0	0	0	0	42.33	307.28	608.59	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 1925.12 (98)

Space heating requirement in kWh/m²/year 14.26 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement (calculated above)	550.73	282.9	112.89	18.58	1.84	0	0	0	0	42.33	307.28	608.59	kWh/year
(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$													(211)
	550.73	282.9	112.89	18.58	1.84	0	0	0	0	42.33	307.28	608.59	
Total (kWh/year) = Sum(211) _{1..5,10...12} =													1925.12 (211)
Space heating fuel (secondary), kWh/month													
= $\{[(98)m \times (201)]\} \times 100 \div (208)$													
(215)m =	0	0	0	0	0	0	0	0	0	0	0	0	
Total (kWh/year) = Sum(215) _{1..5,10...12} =													0 (215)
Water heating													
Output from water heater (calculated above)	165	116.72	75.13	6.45	0	0	0	0	24.22	90.26	138.78	164.91	
Efficiency of water heater													100 (216)
(217)m =	100	100	100	100	100	100	100	100	100	100	100	100	(217)
Fuel for water heating, kWh/month													
(219)m = (64)m x 100 ÷ (217)m													
(219)m =	165	116.72	75.13	6.45	0	0	0	0	24.22	90.26	138.78	164.91	
Total = Sum(219a) _{1..12} =													781.46 (219)
Annual totals													
Space heating fuel used, main system 1													1925.12 kWh/year
Water heating fuel used													781.46 kWh/year
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside													528.43 (230a)
central heating pump:													30 (230c)
Total electricity for the above, kWh/year													558.43 (231) sum of (230a)...(230g) =
Electricity for lighting													478.11 (232)
Electricity generated by PVs													-3166.45 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =													576.68 (338)

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)	(211) x	=	0.519	=	999.14 (261)
Space heating (secondary)	(215) x	=	0.519	=	0 (263)
Water heating	(219) x	=	0.519	=	405.58 (264)
Space and water heating	(261) + (262) + (263) + (264) =				1404.72 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	=	0.519	=	289.83 (267)
Electricity for lighting	(232) x	=	0.519	=	248.14 (268)
Energy saving/generation technologies Item 1		=	0.519	=	-1643.39 (269)

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Total CO2, kg/year

sum of (265)...(271) =

299.3

(272)

Dwelling CO2 Emission Rate

(272) ÷ (4) =

2.22

(273)

El rating (section 14)

98

(274)

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