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Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m												
	0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

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

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 73.1 (23c)

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

(24a)m=	0.65	0.64	0.63	0.58	0.57	0.52	0.52	0.51	0.54	0.57	0.59	0.61	(24a)

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

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

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

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

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

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

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

(25)m=	0.65	0.64	0.63	0.58	0.57	0.52	0.52	0.51	0.54	0.57	0.59	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			6	x	1.8	=	10.8			(26)
Doors Type 2			4	x	1.8	=	7.2			(26)
Windows Type 1			122	x1/[1/(1.8)+ 0.04]		=	204.85			(27)
Windows Type 2			64	x1/[1/(1.8)+ 0.04]		=	107.46			(27)
Windows Type 3			90	x1/[1/(1.8)+ 0.04]		=	151.12			(27)
Windows Type 4			105	x1/[1/(1.8)+ 0.04]		=	176.31			(27)
Windows Type 5			130	x1/[1/(1.4)+ 0.04]		=	172.35			(27)
Windows Type 6			30	x1/[1/(1.4)+ 0.04]		=	39.77			(27)
Rooflights Type 1			27	x1/[1/(1.4) + 0.04]		=	37.8			(27b)
Rooflights Type 2			25	x1/[1/(1.4) + 0.04]		=	35			(27b)
Rooflights Type 3			5.4	x1/[1/(1.4) + 0.04]		=	7.56			(27b)
Rooflights Type 4			8.7	x1/[1/(1.4) + 0.04]		=	12.18			(27b)
Floor Type 1			143	x	0.2	=	28.6			(28)

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Floor Type 2			1127	x	0.2	=	225.4		(28)
Walls Type1	476	94	382	x	0.28	=	106.96		(29)
Walls Type2	453	239	214	x	0.28	=	59.92		(29)
Walls Type3	288	122	166	x	0.28	=	46.48		(29)
Walls Type4	330	90	240	x	0.28	=	67.2		(29)
Walls Type5	100	0	100	x	0.28	=	28		(29)
Roof Type1	528	25	503	x	0.14	=	70.42		(30)
Roof Type2	240	41.1	198.9	x	0.14	=	27.85		(30)
Roof Type3	550	0	550	x	0.14	=	77		(30)
Roof Type4	40	0	40	x	0.14	=	5.6		(30)
Total area of elements, m²			4281						(31)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 1700.92 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 360707.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K 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 642.15 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 2343.07 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	1775.61	1748.02	1720.43	1582.46	1554.87	1416.9	1416.9	1389.31	1472.09	1554.87	1610.05	1665.24	(38)

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

(39)m=	4118.68	4091.09	4063.49	3925.53	3897.93	3759.97	3759.97	3732.37	3815.15	3897.93	3953.12	4008.31	

Average = Sum(39)$_{1...12}$ /12= 3918.63 (39)

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

(40)m=	1.76	1.75	1.73	1.68	1.66	1.6	1.6	1.59	1.63	1.66	1.69	1.71	

Average = Sum(40)$_{1...12}$ /12= 1.67 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 5.79 (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) + 36 171.66 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	188.83	181.96	175.09	168.23	161.36	154.49	154.49	161.36	168.23	175.09	181.96	188.83	

Total = Sum(44)$_{1...12}$ = 2059.93 (44)

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

(45)m=	280.03	244.91	252.73	220.33	211.42	182.44	169.05	193.99	196.31	228.78	249.73	271.19	
											Total = Sum(45)$_{1...12}$ =	2700.9	(45)

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

(46)m=	42	36.74	37.91	33.05	31.71	27.37	25.36	29.1	29.45	34.32	37.46	40.68	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	1000	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):		0	(48)
Temperature factor from Table 2b		0	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	1000	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.01	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0.49	(52)
Temperature factor from Table 2b		0.54	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	3.19	(54)
Enter (50) or (54) in (55)		3.19	(55)

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

(56)m=	98.77	89.21	98.77	95.58	98.77	95.58	98.77	98.77	95.58	98.77	95.58	98.77	(56)

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

(57)m=	98.77	89.21	98.77	95.58	98.77	95.58	98.77	98.77	95.58	98.77	95.58	98.77	(57)

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

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

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

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

(62)m=	402.06	355.13	374.76	338.43	333.45	300.53	291.08	316.02	314.4	350.81	367.82	393.22	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	402.06	355.13	374.76	338.43	333.45	300.53	291.08	316.02	314.4	350.81	367.82	393.22	
											Output from water heater (annual)$_{1...12}$	4137.72	(64)

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

(65)m=	190.73	169.61	181.66	167.74	167.92	155.14	153.84	162.13	159.75	173.69	177.51	187.8	(65)

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

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

Metabolic gains (Table 5), Watts

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