Table 1: Hot water energy requirements

Floor area TFA (m^2)	(a) Hot water usage V_d (litres/day)	(b) Energy content of water used (kWh/year)	(c) Distribution loss (kWh/year)
30	63	1146	202
40	71	1293	228
50	79	1437	254
60	87	1577	278
70	95	1713	302
80	102	1846	326
90	109	1976	349
100	116	2102	371
110	123	2225	393
120	129	2344	414
130	136	2460	434
140	142	2572	454
150	148	2681	473
160	154	2787	492
170	159	2889	510
180	165	2987	527
190	170	3082	544
200	175	3174	560
210	180	3262	576
220	185	3347	591
230	189	3428	605
240	193	3506	619
250	197	3581	632
260	201	3652	644
270	205	3719	656
280	209	3783	668
290	212	3844	678
300	215	3901	688

Notes:

Alternatively, the hot water usage and the distribution loss may be calculated from the total floor area of the dwelling (TFA), using the following steps:

(a) Calculate $N = 0.035 \times TFA - 0.000038 \times TFA^2$, *if* $TFA \leq 420$

$N = 8$ *if* $TFA > 420$

Hot water usage $= (25 \times N) + 38$

(b) Energy content of water used $= [(61 \times N) + 92] \times 0.85 \times 8.76$

(c) Distribution loss $= [(61 \times N) + 92] \times 0.15 \times 8.76$

Table 2: Hot water storage loss factor (kWh/litre/day)

If the manufacturer's declared loss is available, see Table 2b.

In the absence of manufacturer's declared cylinder loss, the loss factor L from Table 2 is multiplied by the cylinder volume in litres, by the volume factor from Table 2a, and by the appropriate temperature factor from Table 2b, to obtain the loss rate. These data apply to cylinders heated by gas, oil and solid fuel boilers and by electric immersion, and to stores within combi boilers.

For community heating systems with no cylinder in the dwelling, use loss factor for 50 mm factory insulation and a cylinder size of 110 litres.

For an electric CPSU, the loss 0.022 kWh/litre/day

In the case of a combination boiler:

a) the storage loss factor is zero if the efficiency is taken from Table 4b;
b) the loss is to be included for a storage combination boiler if its efficiency is the manufacturer's declared value or is obtained from the Boiler Database (in which case its insulation thickness and volume are also to be provided by the manufacturer or obtained from the Database).

Insulation thickness, mm	**Cylinder loss factor (L)** kWh/litre/day	
	Factory insulated cylinder	**Loose jacket**
0	0.1425	0.1425
12	0.0394	0.0760
25	0.0240	0.0516
35	0.0191	0.0418
38	0.0181	0.0396
50	0.0152	0.0330
80	0.0115	0.0240
120	0.0094	0.0183
160	0.0084	0.0152

Notes:

Alternatively the heat loss factor, L, may be calculated for insulation thickness of t mm as follows:

Cylinder, loose jacket: L = 0.005 + 1.76/(t + 12.8)
Cylinder, factory insulated: L = 0.005 + 0.55/(t + 4.0)

Table 2a: Volume factor for cylinders and storage combis

Volume V_c	Volume Factor VF
40	1.442
60	1.259
80	1.145
100	1.063
120	1.00
140	0.950
160	0.908
180	0.874
200	0.843
220	0.817
240	0.794
260	0.773
280	0.754

Notes:

1.When using the data in Table 2, the loss is to be multiplied by the volume factor.

2. Alternatively, the volume factor can be calculated using the equation $VF = (120 / V_c)^{1/3}$

Table 2b: Factors to be applied to losses for cylinders, thermal stores and CPSUs

Type of water storage	Temperature Factor	
	for manufacturer's declared loss	**for loss from Table 2**
Cylinder	0.60 [a) b)]	0.60 [a) b)]
Storage combi boiler, primary store	n/a	Store volume ≥ 115 litres: 0.82 Store volume < 115 litres: $0.82 + 0.0022 \times (115 - V_c)$
Storage combi boiler, secondary store	n/a	Store volume ≥ 115 litres: 0.60 Store volume < 115 litres: $0.60 + 0.0016 \times (115 - V_c)$
Hot water only thermal store	0.89 [c)]	1.08 [c) d)]
Integrated thermal store and gas-fired CPSU	0.89 [c)]	1.08 [c) d)]
Electric CPSU:		
winter operating temperature 85°C	1.09	1.00
90°C	1.15	
95°C	1.21	

Notes:

[a)] *Multiply Temperature Factor by 1.3 if a cylinder thermostat is absent.*

[b)] *Multiply Temperature Factor by 0.9 if there is separate time control of domestic hot water (boiler systems only)*

[c)] *Multiply Temperature Factor by 0.81 if the thermal store or CPSU has separate timer for heating the store*

[d)] *Multiply Temperature Factor by 1.1 if the thermal store or CPSU is not in an airing cupboard*

Table 3: Primary circuit losses

System type	kWh/year
Electric immersion heater	0
Boiler with uninsulated primary pipework* and no cylinder thermostat	1220
Boiler with insulated primary pipework and no cylinder thermostat	610
Boiler with uninsulated primary pipework and with cylinder thermostat	610
Boiler with insulated primary pipework and with cylinder thermostat	360
Combi boiler	0
CPSU (including electric CPSU)	0
Boiler and thermal store within a single casing (cylinder thermostat present)	0
Separate boiler and thermal store connected by no more than 1.5 m of insulated pipework	0
Separate boiler and thermal store connected by: - uninsulated primary pipe work - more than 1.5 m of insulated primary pipe work	 470 280
Community heating	360

Note:
** "Primary pipework" means the pipes between a boiler and a hot water tank*

Table 3a: Additional losses for combi boilers

Combi type	kWh/year
Instantaneous, without keep-hot facility*	600 a)
Instantaneous, with keep-hot facility controlled by time clock	600
Instantaneous, with keep-hot facility not controlled by time clock	900
Storage combi boiler** store volume $V_c \geq 55$ litres	0
Storage combi boiler** store volume $V_c < 55$ litres	$600 - (V_c - 15) \times 15$ a)

a) If the hot water usage from Table 1 is less than 100 litres/day, multiply by (daily hot water usage) / 100

Notes:
* *"keep-hot facility" is defined in Appendix D, section D1.16. The facility to keep water hot may have an on/off switch for the user, or it may be controlled by a time switch. If the store is 15 litres or more, the boiler is a storage combination boiler.*

In the case of keep-hot:
1) *If the keep-hot facility is maintained hot solely by burning fuel, use an appropriate loss for combi boiler from the above table and proceed with the calculation as normal.*
2) *If the keep-hot facility is maintained by electricity, use the following approach:*
   a) *include appropriate combi losses from Table 3a in box (49);*
   b) *calculate energy required for water heating as [(51) – (49)] x 100 ÷ (86) and enter in box (86a). See also Table 4f.*
3) *In the case of an untimed electrically powered keep-hot facility where the power rating of the keep-hot heater is obtained from the Boiler Efficiency database, the loss should be taken as:*
   Loss =8.76 x P (kWh/year)
   where P is the power rating of the heater in watts

** *"storage combi boilers" are defined in Appendix D, section D1.10.*

Table 4a: Heating system seasonal efficiency (space and water)

1. *The table shows space heating efficiency. The same efficiency applies for water heating when hot water is supplied from a boiler system.*
2. *For independent water heaters see section at the end of table.*
3. *'Heating type' refers to the appropriate column in Table 8.*
4. *'Responsiveness (R) is used to calculate entry in box (72) of worksheet.*

	Efficiency %		Heating type	Respon-siveness (R)
CENTRAL HEATING SYSTEMS WITH RADIATORS OR UNDERFLOOR HEATING				
Gas boilers and oil boilers				
For efficiency, use boiler database (www.boilers.org.uk) if possible, otherwise use efficiency from Table 4b. Use Table 4c for efficiency adjustments. Use Table 4d for heating type and responsiveness. Refer to Group 1 in Table 4e for control options and temperature adjustments due to control.				
Micro-cogeneration (micro-CHP)				
See Appendix N. Performance data to be obtained from boiler database (www.boilers.org.uk). Use Table 4c for efficiency adjustments. Refer to Group 1 in Table 4e for control options and temperature adjustments due to control.				
Solid fuel boilers				
For efficiency, use boiler database if possible, otherwise use efficiency from this table. Column (A) gives minimum values for HETAS approved appliances, use column (B) for other appliance (see section 9.2.3). For open fires with back boilers and closed roomheaters with boilers the efficiencies are the sum of heat to water and heat to room. Refer to Group 1 in Table 4e for control options	(A)	(B)		
Manual feed boiler in heated space (mineral or wood) [a]	65	60	2	0.75
Manual feed boiler in unheated space (mineral or wood) [a]	60	55	2	0.75
Auto (gravity) feed boiler in heated space [a]	70	65	2	0.75
Auto (gravity) feed boiler in unheated space [a]	65	60	2	0.75
Open fire with back boiler to radiators, trapezium grate	63	55	3	0.50
Open fire with back boiler to radiators, rectangular grate	65	55	3	0.50
Closed roomheater with boiler to radiators	67	65	3	0.50
Wood chip/pellet boiler	67	65	2	0.75
Range cooker boiler (integral oven and boiler)	50	45	3	0.50
Range cooker boiler (independent oven and boiler)	60	55	3	0.50
[a] Heated space means within the boundary of the dwelling as defined in section 1, "Dwelling dimensions"				
Electric boilers				
Refer to Group 1 in Table 4e for control options				
Direct acting electric boiler	100		1	1.0
Electric CPSU in heated space [a]	100		2	0.75
Dry core storage boiler in heated space [a] [b]	100		2	0.75
Dry core storage boiler in unheated space [a] [b]	85		2	0.75
Water storage boiler in heated space [a] [b]	100		2	0.75
Water storage boiler in unheated space [a] [b]	85		2	0.75
[a] Heated space means within the boundary of the dwelling as defined in section 1, "Dwelling dimensions"				
[b] Store within boiler capable of meeting all space heating needs				
Heat pumps (see also warm air systems)				
Refer to Group 2 in Table 4e for control options				
Ground-to-water heat pump (electric)	320		From Table 4d	

Ground-to-water heat pump with auxiliary heater (electric)	300	From Table 4d	
Water-to-water heat pump (electric)	300	From Table 4d	
Air-to-water heat pump (electric)	250	From Table 4d	
Gas-fired, ground or water source	120	From Table 4d	
Gas-fired, air source	110	From Table 4d	

COMMUNITY HEATING SCHEMES

For calculation of CO_2 emissions: if known, use manufacturer's declared efficiency instead of the value in this table.
For calculation of SAP rating: use 100% reduced by the amount in the "efficiency adjustment" column of Table 4c.
Refer to Group 3 in Table 4e for control options.
Check Table 4c for efficiency adjustment due to controls.
Allow for distribution loss (see Table 12c).

Community heating boilers	75	1	1.0

ELECTRIC STORAGE SYSTEMS

Refer to Group 4 in Table 4e for control options.

Off-peak tariffs:

Old (large volume) storage heaters	100	5	0.0
Modern (slimline) storage heaters	100	4	0.25
Convector storage heaters	100	4	0.25
Fan storage heaters	100	3	0.5
Modern (slimline) storage heaters with Celect-type control	100	3	0.5
Convector storage heaters with Celect-type control	100	3	0.5
Fan storage heaters with Celect-type control	100	2	0.75
Integrated storage/direct acting heater	100	2	0.75

24-hour heating tariff:

Modern (slimline) storage heaters	100	3	0.5
Convector storage heaters	100	3	0.5
Fan storage heaters	100	3	0.5
Modern (slimline) storage heaters with Celect-type control	100	2	0.75
Convector storage heaters with Celect-type control	100	2	0.75
Fan storage heaters with Celect-type control	100	2	0.75

ELECTRIC UNDERFLOOR HEATING

Refer to Group 7 in Table 4e for control options.

Off-peak tariffs:

In concrete slab (off-peak only)	100	5	0.0
Integrated (storage/direct acting)	100	4	0.25
Integrated (storage/direct acting) with low (off-peak) tariff control	100	3	0.50

Standard tariff:

In thin screed (45-60 mm)	100	2	0.75
In timber floor	100	1	1

WARM AIR SYSTEMS

Refer to Group 5 in Table 4e for control options.

Gas-fired warm air with fan-assisted flue

Ducted, on-off control, pre 1998	70	1	1.0
Ducted, on-off control, 1998 or later	76	1	1.0
Ducted, modulating control, pre 1998	72	1	1.0
Ducted, modulating control, 1998 or later	78	1	1.0
Roomheater, with in-floor ducts	69	1	1.0

Gas fired warm air with balanced or open flue			
Ducted or stub-ducted. on-off control, pre 1998	70	1	1.0
Ducted or stub-ducted. on-off control, 1998 or later	76	1	1.0
Ducted or stub-ducted, modulating control, pre 1998	72	1	1.0
Ducted or stub-ducted, modulating control, 1998 or later	78	1	1.0
Ducted or stub-ducted with flue heat recovery	85	1	1.0
Condensing	81	1	1.0
Oil-fired warm air			
Ducted output (on/off control)	70	1	1.0
Ducted output (modulating control)	72	1	1.0
Stub duct system	70	1	1.0
Electric warm air			
Electricaire system	100	2	0.75
Heat pumps			
Refer to Group 2 in Table 4e for control options.			
Ground-to-air heat pump (electric)	320	1	1.0
Ground-to-air heat pump with auxiliary heater (electric)	300	1	1.0
Water-to-air heat pump (electric)	300	1	1.0
Air-to-air heat pump (electric)	250	1	1.0
Gas-fired, ground or water source	120	1	1.0
Gas-fired, air source	110	1	1.0

ROOM HEATERS

Refer to Group 6 in Table 4e for control options.
If declared efficiency is available (see Appendix E) use instead of value from table.

Gas (including LPG) room heaters:			
Gas fire, open flue, pre-1980 (open fronted)	50	1	1.0
Gas fire, open flue, 1980 or later (open fronted), sitting proud of, and sealed to, fireplace opening	63	1	1.0
Gas fire or wall heater, balanced flue	58	1	1.0
Gas fire, open flue (open fronted), sitting proud of, and sealed to, fireplace opening, with back boiler unit	63	1	1.0
Flush fitting Live Fuel Effect gas fire (open fronted), sealed to fireplace opening, with back boiler unit	40	1	1.0
Gas fire, closed fronted, fan assisted	72	1	1.0
Condensing gas fire	85	1	1.0
Flush fitting Live Fuel Effect gas fire (open fronted), sealed to fireplace opening	40	1	1.0
Flush fitting Live Fuel Effect gas fire (open fronted), fan assisted, sealed to fireplace opening	45	1	1.0
Decorative Fuel Effect gas fire, open to chimney	20	1	1.0
Gas fire, flueless	90	1	1.0
(add additional ventilation requirements in box (9a)			
Oil room heaters:			
Room heater, pre 2000	55	1	1.0
Room heater, 2000 or later	60	1	1.0
Room heater with boiler (no radiators), pre 2000	65	1	1.0
Room heater with boiler (no radiators), 2000 or later	70	1	1.0

Solid fuel room heaters

Column (A) gives minimum values for HETAS approved appliances, use column (B) for other appliances (see section 9.2.3).

	(A)	(B)		
Open fire in grate	37	32	3	0.50

Open fire with back boiler (no radiators)	50	50	3	0.50
Closed room heater	65	60	3	0.50
Closed room heater with boiler (no radiators)	67	65	3	0.50
Stove (pellet fired)	67	65	2	0.75
Electric (direct acting) room heaters:				
Panel, convector or radiant heaters		100	1	1.0
Fan heaters		100	1	1.0
Portable electric heaters		100	1	1.0
OTHER SPACE HEATING SYSTEMS				
Refer to Group 7 in Table 4e for control options.				
Electric ceiling heating		100	2	0.75
HOT-WATER-ONLY SYSTEMS				
If water heating from main system, use efficiency of main system.				
Electric immersion (on-peak or off-peak)		100		n/a
Back boiler (hot water only), gas		65		n/a
From a circulator built into a gas warm air system, pre 1998		65		n/a
From a circulator built into a gas warm air system, 1998 or later		73		n/a
Single-point gas water heater (instantaneous at point of use)		70		n/a
Multi-point gas water heater (instantaneous serving several taps)		65		n/a
Electric instantaneous at point of use		100		n/a

Table 4b: Seasonal efficiency for gas and oil boilers

1. *This table is to be used only for gas and oil boilers for which the SEDBUK is not available.*
2. *The table shows seasonal efficiencies for space heating. The same seasonal efficiencies should be assumed for water heating when hot water is supplied from a boiler system.*
3. *See Appendix B for guidance on boiler classification.*
4. *Apply efficiency adjustments in Table 4c if appropriate.*
5. *See Table 4d for heating type and responsiveness.*

Boiler	Efficiency, %
Gas boilers (including LPG) 1998 or later	
Non-condensing (including combis) with automatic ignition	73
Condensing (including combis) with automatic ignition	83
Non-condensing (including combis) with permanent pilot light	69
Condensing (including combis) with permanent pilot light	79
Back boiler	65
Gas boilers (including LPG) pre-1998, with fan-assisted flue	
Low thermal capacity	72
High or unknown thermal capacity	68
Combi	70
Condensing combi	83
Condensing	83
Gas boilers (including LPG) pre-1998, with balanced or open flue	
Wall mounted	65
Floor mounted, pre 1979	55
Floor mounted, 1979 to 1997	65
Combi	65
Back boiler	65
Combined Primary Storage Units (CPSU) (mains gas and LPG)	
With permanent pilot (non-condensing)	70
With automatic ignition (non-condensing)	74
With permanent pilot (condensing)	79
With automatic ignition (condensing)	83
Oil boilers	
Standard oil boiler pre-1985	65
Standard oil boiler 1985 to 1997	70
Standard oil boiler, 1998 or later	79
Condensing	83
Combi, pre-1998	70
Combi, 1998 or later	76
Condensing combi	81
Oil room heater + boiler, pre 2000	65
Oil room heater + boiler, 2000 or later	70
Range cooker boilers (mains gas and LPG)	
Single burner with permanent pilot	46
Single burner with automatic ignition	50
Twin burner with permanent pilot (non-condensing) pre 1998	60
Twin burner with automatic ignition (non-condensing) pre 1998	65
Twin burner with permanent pilot (non-condensing) 1998 or later	65
Twin burner with automatic ignition (non-condensing) 1998 or later	70
Range cooker boilers (oil)	
Single burner	60
Twin burner (non-condensing) pre 1998	70
Twin burner (non-condensing) 1998 or later	75

Table 4c: Efficiency adjustments

Heating system	Efficiency adjustment, %	
Gas or oil boiler systems with radiators or underfloor heating: *The adjustments are to be applied to the space and water heating seasonal efficiency for both the SEDBUK value and for efficiency values from Table 4b.*		
(1) Efficiency adjustment due to lower temperature of distribution system:	**Mains gas**	**Oil or LPG**
Condensing boiler with load compensator [a)]	+2	+1
Condensing boiler with weather compensator [a)]	+2	+1
Condensing boiler with under-floor heating [a) b)]	+3	+2
Condensing boiler with thermal store [a)]	0	0
(2) Efficiency adjustment due to control system		
No thermostatic control of room temperature [c)]	-5	
No boiler interlock [c)]	-5	
Community heating systems:		
(3) Efficiency adjustment due to controls		
Flat rate charging [d)], no thermostatic control of room temperature	-10	
Flat rate charging, programmer and room thermostat	-5	
Flat rate charging, programmer and TRVs	0	
Charging system linked community heating, programmer + TRVs	0	
Heat pumps:	**Multiply efficiency by:**	
(4) Efficiency adjustment due to temperature of heat supplied	**Space**	**DHW**
Heat pump with underfloor heating	1.0	
Heat pump with radiators without load or weather compensation [e)]	0.7	
Heat pump with radiators and load or weather compensation [e)]	0.75	
Heat pump supplying all DHW		0.7
Heat pump supplying 50% DHW (see Appendix G)		1.0

Notes:

a) These are mutually exclusive and therefore do not accumulate; if more than one applies, the highest applicable efficiency adjustment is to be used.

b) Adjustment is applicable if the boiler supplies only the underfloor heating, and not if it also feeds radiators or supplies hot water.

c) These do not accumulate as no thermostatic control or presence of a bypass means that there is no boiler interlock.

d) 'Flat rate charging' means that households pay for the heat according to a fixed monthly or annual amount, not depending on the amount of heat actually used. If the charges vary within a scheme for other reasons, for example according to dwelling size, it is still classified as flat rate. The last entry under 'Community heating schemes' refers to a system in which the charges are substantially related to the amount of heat used.

e) Based on maximum heat distribution temperature of 50°C.

Table 4d: Heating type and responsiveness for wet systems with heat supplied to radiators or underfloor heating

Heat emitter	Heating type	Responsiveness (R)
Systems with radiators:	1	1.0
Underfloor heating (wet system):		
pipes in insulated timber floor	1	1.0
pipes in screed or concrete slab	4	0.25

Table 4e: Heating system controls

1. *Use Table 4a to select appropriate Group in this table.*
2. *'Control' indicates the appropriate column to use in Table 9.*
3. *The 'Temperature adjustment' modifies the living area mid internal temperature obtained from Table 8 and should be entered into box (71) of the worksheet.*

Type of control	Control	Temperature adjustment, °C	Reference to other possible adjustments
GROUP 1: BOILER SYSTEMS WITH RADIATORS OR UNDERFLOOR HEATING			
No time or thermostatic control of room temperature	1	+0.6	Table 4c(2)
Programmer, no thermostat	1	+0.6	Table 4c(2)
Room thermostat only	1	0	Table 4c(2)
Programmer + room thermostat	1	0	Table 4c(2)
Programmer + at least two room thermostats	2	0	Table 4c(2)
Programmer + room thermostat + TRVs	2	0	Table 4c(2)
Programmer + TRVs + bypass	2	0	Table 4c(2)
Programmer + TRVs + flow switch	2	0	Table 4c(2)
Programmer + TRVs + boiler energy manager	2	0	Table 4c(2)
Time and temperature zone control	3	0	Table 4c(2)
Adjustments for features of control systems: (applicable to any control option above and in addition to the adjustments selected above)			
Delayed start thermostat	one of the above	-0.15	n/a
Load or weather compensation	one of the above	0	Table 4c(1)
Temperature control of water heating (cylinderstat)	n/a	n/a	Tables 2b and 3
Time control of water heating (separate programming)	n/a	n/a	Table 2b
Adjustments for features other than controls:			
Temperature adjustment for CPSU or integrated thermal store	n/a	-0.1	n/a
Underfloor heating	n/a	n/a	Table 4c(1)
GROUP 2: HEAT PUMPS			
No time or thermostatic control of room temperature	1	+0.3	Table 4c(4)
Programmer, no thermostat	1	+0.3	Table 4c(4)
Room thermostat only	1	0	Table 4c(4)
Programmer + room thermostat	1	0	Table 4c(4)
Programmer + at least two room thermostats	2	0	Table 4c(4)
Programmer + TRVs + bypass	2	0	Table 4c(4)
Time and temperature zone control	3	0	Table 4c(4)
Adjustments for features of control systems: (applicable to any control option above and in addition to the adjustments selected above)			
Load or weather compensation	one of the above	0	Table 4c(4)
Temperature control of water heating (cylinderstat)	n/a	n/a	Tables 2b and 3
Time control of water heating (separate programming)	n/a	n/a	Table 2b

Table 4e continued

Type of control	Control	Temperature adjustment, °C	Reference to other possible adjustments
GROUP 3: COMMUNITY HEATING SCHEMES			
Flat rate charging*, no thermostatic control of room temperature	1	+0.3	Table 4c(3)
Flat rate charging*, programmer and room thermostat	1	0	Table 4c(3)
Flat rate charging*, programmer and TRVs	2	0	Table 4c(3)
Charging system linked to use of community heating, programmer and TRVs	3	0	Table 4c(3)
* 'Flat rate charging' means that households pay for the heat according to a fixed monthly or annual amount, not depending on the amount of heat actually used. If the charges vary within a scheme for other reasons, for example according to dwelling size, it is still classified as flat rate. The last entry refers to a system in which the charges are substantially related to the amount of heat used.			
GROUP 4: ELECTRIC STORAGE SYSTEMS			
Manual charge control	3	+0.3	n/a
Automatic charge control	3	0	n/a
Celect-type controls	3	0	n/a
GROUP 5: WARM AIR SYSTEMS			
No thermostatic control of room temperature	1	+0.3	n/a
Room thermostat only	1	0	n/a
Programmer + room thermostat	1	0	n/a
Time and temperature zone control	3	0	n/a
GROUP 6: ROOM HEATER SYSTEMS			
No thermostatic control of room temperature	2	+0.3	n/a
Appliance thermostats	3	0	n/a
Programmer + appliance thermostats	3	0	n/a
Room thermostats only	3	0	n/a
Programmer + room thermostats	3	0	n/a
GROUP 7: OTHER SYSTEMS			
No thermostatic control of room temperature	1	+0.3	n/a
Room thermostat only	1	0	n/a
Programmer + room thermostat	1	0	n/a
Temperature zone control	2	0	n/a
Time and temperature zone control	3	0	n/a

Note:

** 'Flat rate charging' means that households pay for the heat according to a fixed monthly or annual amount, not depending on the amount of heat actually used. If the charges vary within a scheme for other reasons, for example according to dwelling size, it is still classified as flat rate. The last entry under 'Community heating schemes' refers to a system in which the charges are substantially related to the amount of heat used.*

Table 4f: Electricity for fans and pumps and electric keep-hot facility

Equipment	kWh/year
Heating system:	
Central heating pump (supplying hot water to radiators or underfloor system)	130 [a]
Oil boiler [b] - pump (supplying oil to boiler and flue fan) [c]	100 [a]
Gas boiler - flue fan (if fan assisted flue)	45
Warm air heating system fans [d]	0.6 × V
Keep-hot facility of a combi boiler:	
Electricity for maintaining keep-hot facility [e] - keep-hot facility, controlled by time clock - keep-hot facility, not controlled by time clock [f]	 600 900
Ventilation system:	
Mechanical extract ventilation [g]	SFP × 1.22 × V
Balanced whole house mechanical ventilation fans [g]	SFP × 1.22 × V
Positive input ventilation (from loft space)	0
Positive input ventilation (from outside) [g]	SFP × 1.22 × V
Solar water heating pump:	
Solar water heating pump, electrically powered Solar water heating pump, PV powered	75 0

Notes:

[a] *Multiply by a factor of 1.3 if room thermostat is absent.*

[b] *Applies to all oil boilers that provide main heating, but not if boiler provides hot water only.*

[c] *The same motor operates both the pump and the flue fan.*

[d] *If the heating system is a warm air unit and there is whole house ventilation, the electricity for warm air circulation should not be included in addition to the electricity for mechanical ventilation. V is the volume of the dwelling.*

[e] *See notes to Table 3a for the definition of keep-hot facility.*

[f] *In the case of an untimed electrically powered keep-hot facility where the power rating of the keep-hot heater is obtained from the Boiler Efficiency database, the electricity consumed for maintaining the keep-hot facility should be taken as:*

electricity consumed = 8.76 x P (kWh/year); where P is the power rating in watts.

[g] *SFP is specific fan power in W/(litre/sec), see paragraph 2.6 and Table 4g, V is volume of the dwelling in m³.*

Table 4g: Specific fan power for mechanical ventilation systems

Type of mechanical ventilation	SFP, W/(litre/sec)
Balanced whole house mechanical ventilation, with or without heat recovery	2.0
Mechanical extract ventilation, or positive input ventilation from outside	0.8

Table 5: Lighting, appliances, cooking and metabolic gains

Floor area (m^2)	Gains (W)	**Floor area (m^2)**	Gains (W)
30	230	**170**	893
40	282	**180**	935
50	332	**190**	978
60	382	**200**	1020
70	431	**210**	1061
80	480	**220**	1102
90	528	**230**	1142
100	576	**240**	1181
110	623	**250**	1220
120	669	**260**	1259
130	715	**270**	1297
140	760	**280**	1334
150	805	**290**	1349
160	849	**300**	1359

Notes:
Alternatively, gains may be calculated from the total floor area of the dwelling (TFA), using the following steps:

(1) Calculate $N = 0.035 \times TFA - 0.000038 \times TFA^2$ *if* $TFA \leq 420$
$N = 8$ *if* $TFA > 420$

(2) Calculate gains (W) $= 74 + 2.66 \times TFA + 75.5 \times N$ *if* $TFA \leq 282$
$= 824 + 75.5 \times N$ *if* $TFA > 282$

If there is low-energy lighting the gains should be reduced to take account of the reduced gains from lighting (see Appendix L).

Table 5a: Gains from fans and pumps

Function	**Gains (W)**
Central heating pump [a)]	10
Oil boiler pump, inside dwelling [b)]	10
Warm air heating system fans [a) c)]	$0.06 \times V$
Balanced whole house mechanical ventilation fans	$SFP \times 0.06 \times V$

Notes:
a) *Does not apply to community heating*
b) *Only for boiler providing main heating. In addition to central heating pump, but not if oil pump is outside dwelling.*
c) *If the heating system is a warm air unit and there is whole house ventilation, the gains for warm air circulation should not be included in addition to the gains for mechanical ventilation. V is the volume of the dwelling.*

Table 6a: Solar flux (W/m^2)

	Horizontal	Vertical				
		North	NE/NW	E/W	SE/SW	South
Heating season	75	29	34	48	64	72
Summer period (use in Appendix P)	187	75	89	109	112	107

Notes:

1. *Use E/W orientation when the orientation is not known.*
2. *For a roof window in a pitched roof with a pitch of less than 70°, use the value under 'North' for orientation within 30° of North and the value under 'Horizontal' for all other orientations. If the pitch is 70° or greater, treat as if it is a vertical window.*
3. *Solar flux for heating season should be used in SAP worksheet.*
4. *Solar flux for summer period should be used for calculating summer overheating (Appendix P).*

Table 6b: Transmittance factors for glazing

Type of glazing	Total solar energy transmittance, $g_\perp$ (for calculation of solar gains in section 6 of the worksheet)	Light transmittance, g_L (for calculation of lighting requirement in Appendix L)
Single glazed	0.85	0.90
Double glazed (air or argon filled)	0.76	0.80
Double glazed (Low-E, hard-coat)	0.72	
Double glazed (Low-E, soft-coat)	0.63	
Triple glazed (air or argon filled)	0.68	0.70
Triple glazed (Low-E, hard-coat)	0.64	
Triple glazed (Low-E, soft-coat)	0.57	

Notes:

1. *The values are for normal incidence of solar radiation and they are multiplied by 0.9 (both solar and light transmittance) in calculations.*
2 *When the window U-value is declared by the manufacturer (rather than from Table 6e) the solar transmittance should also be obtained from the manufacturer. In this case, ascertain whether the solar transmittance is related to the glazing only or to the whole window: see section 6.1.*
3. *Light transmittance should always be taken from Table 6b, irrespective of the source of the U-value and solar transmittance.*

Table 6c: Frame factors for windows and doors

Frame type	Frame factor (proportion of opening that is glazed)
Wood	0.7
Metal	0.8
Metal, thermal break	0.8
PVC-U	0.7

Note: If known, the actual frame factor can be used instead of the data in Table 6c provided that it is obtained either for the standard window configuration defined in BR 443 or it is an area-weighted average of all windows in the dwelling.

Table 6d: Solar and light access factors

Overshading	**% of sky blocked by obstacles.**	**Winter solar access factor** (for calculation of solar gains in section 6 of the worksheet)	**Summer solar access factor** (for calculation of summer temperatures in Appendix P)	**Light access factor** (for calculation of lighting requirement in Appendix L)
Heavy	> 80%	0.3	0.5	0.5
More than average	>60% - 80%	0.54	0.7	0.67
Average or unknown	20% - 60%	0.77	0.9	0.83
Very little	< 20%	1.0	1.0	1.0

Note: A solar access factor of 1.0 and a light access factor of 1.0 should be used for roof windows.

Table 6e: Indicative U-values (W/m^{2}K) for windows, doors and roof windows

The values apply to the entire area of the window opening, including both frame and glass, and take account of the proportion of the area occupied by the frame and the heat conducted through it. Unless known otherwise, double and triple glazing should be taken as air-filled without low-E coating. If the U-value of the components of the window (glazed unit and frame) are known, window U-values may alternatively be taken from the tables in Annex F of BS EN ISO 10077-1, using the tables for 20% frame for metal-framed windows and those for 30% frame for wood or PVC-U framed windows.

When available, the manufacturer's certified U-values for windows or doors should be used in preference to the data in this table. Adjustments for roof windows should be applied to manufacturer's window U-values unless the manufacturer provides a U-value specifically for a roof window.

	Type of frame					
	Window with wood or PVC-U frame (use adjustment in Note 1)			**Window with metal frame with 4mm thermal break** (use adjustments in Note 2)		
	6 mm gap	**12 mm gap**	**16 or more mm gap**	**6 mm gap**	**12 mm gap**	**16 or more mm gap**
double-glazed, air filled	3.1	2.8	2.7	3.7	3.4	3.3
double-glazed, air filled (low-E, ε_n = 0.2, hard coat)	2.7	2.3	2.1	3.3	2.8	2.6
double-glazed, air filled (low-E, ε_n = 0.15, hard coat)	2.7	2.2	2.0	3.3	2.7	2.5
double-glazed, air filled (low-E, ε_n = 0.1, soft coat)	2.6	2.1	1.9	3.2	2.6	2.4
double-glazed, air filled (low-E, ε_n = 0.05, soft coat)	2.6	2.0	1.8	3.2	2.5	2.3
double-glazed, argon filled	2.9	2.7	2.6	3.5	3.3	3.2
double-glazed, argon filled (low-E, ε_n = 0.2, hard coat)	2.5	2.1	2.0	3.0	2.6	2.5
double-glazed, argon filled (low-E, ε_n = 0.15, hard coat)	2.4	2.0	1.9	3.0	2.5	2.4
double-glazed, argon filled (low-E, ε_n = 0.1, soft coat)	2.3	1.9	1.8	2.9	2.4	2.3
double-glazed, argon filled (low-E, ε_n = 0.05, soft coat)	2.3	1.8	1.7	2.8	2.2	2.1
triple glazed, air filled	2.4	2.1	2.0	2.9	2.6	2.5
triple-glazed, air filled (low-E, ε_n = 0.2, hard coat)	2.1	1.7	1.6	2.6	2.1	2.0
triple-glazed, air filled (low-E, ε_n = 0.15, hard coat)	2.1	1.7	1.6	2.5	2.1	2.0

triple-glazed, air filled (low-E, ε_n = 0.1, soft coat)	2.0	1.6	1.5		2.5	2.0	1.9
triple-glazed, air filled (low-E, ε_n = 0.05, soft coat)	1.9	1.5	1.4		2.4	1.9	1.8
triple-glazed, argon filled	2.2	2.0	1.9		2.8	2.5	2.4
triple-glazed, argon filled (low-E, ε_n = 0.2, hard coat)	1.9	1.6	1.5		2.3	2.0	1.9
triple-glazed, argon filled (low-E, ε_n = 0.15, hard coat)	1.8	1.5	1.4		2.3	1.9	1.8
triple-glazed, argon filled (low-E, ε_n = 0.1, soft coat)	1.8	1.5	1.4		2.2	1.9	1.8
triple-glazed, argon filled (low-E, ε_n = 0.05, soft coat)	1.7	1.4	1.3		2.2	1.8	1.7
Windows and doors, single-glazed	4.8				5.7		
Solid wooden door	3.0						

Notes:

1. *For roof windows with wooden or PVC-U frames apply the following adjustments to U-values:*

Wood or PVC-U frame	*U-value adjustment for roof window, W/m^{2}K*
Single glazed	*+0.3*
Double glazed	*+0.2*
Triple glazed	*+0.2*

2. *For windows or roof windows with metal frames apply the following adjustments to U-values:*

Metal frames	*Adjustment to U-value, W/m^{2}K*	
	Window	*Roof window*
Metal, no thermal break	*+0.3*	*+0.7*
Metal, thermal break 4 mm	*0*	*+0.3*
Metal, thermal break 8 mm	*-0.1*	*+0.2*
Metal, thermal break 12 mm	*-0.2*	*+0.1*
Metal, thermal break 20 mm	*-0.3*	*0.0*
Metal, thermal break 32 mm	*-0.4*	*-0.1*

3. *For doors which are half-glazed (approximately) the U-value of the door is the average of the appropriate window U-value and that of the non-glazed part of the door (e.g. solid wooden door [U-value of 3.0 W/m^{2}K] half-glazed with double glazing [low-E, hard coat, argon filled, 6 mm gap, U-value of 2.5 W/m^{2}K] has a resultant U-value of 0.5(3.0+2.5) = 2.75 W/m^{2}K).*

Table 7: Utilisation factor as a function of gain/loss ratio (GLR)

GLR	Utilisation factor	GLR	Utilisation factor
1	1.00	**16**	0.68
2	1.00	**17**	0.65
3	1.00	**18**	0.63
4	0.99	**19**	0.61
5	0.97	**20**	0.59
6	0.95	**21**	0.58
7	0.92	**22**	0.56
8	0.89	**23**	0.54
9	0.86	**24**	0.53
10	0.83	**25**	0.51
11	0.81	**30**	0.45
12	0.78	**35**	0.40
13	0.75	**40**	0.36
14	0.72	**45**	0.33
15	0.70	**50**	0.30

Note:
Alternatively, the utilisation factor may be calculated by the formula:
Utilisation factor = 1 - exp (- 18 ÷ GLR),
where GLR = [total gains, box(66)] ÷ [heat loss coefficient, box (37)]

Table 8: Mean internal temperature of living area

Number in brackets is from the 'heating type' column of Table 4a or 4d.
HLP is item (38) in the worksheet

HLP	(1)	(2)	(3)	(4)	(5)
1.0 (or lower)	18.88	19.32	19.76	20.21	20.66
1.5	18.88	19.31	19.76	20.20	20.64
2.0	18.85	19.30	19.75	20.19	20.63
2.5	18.81	19.26	19.71	20.17	20.61
3.0	18.74	19.19	19.66	20.13	20.59
3.5	18.62	19.10	19.59	20.08	20.57
4.0	18.48	18.99	19.51	20.03	20.54
4.5	18.33	18.86	19.42	19.97	20.51
5.0	18.16	18.73	19.32	19.90	20.48
5.5	17.98	18.59	19.21	19.83	20.45
6.0 (or higher)	17.78	18.44	19.10	19.76	20.42

Notes:
1 Use heating column (1) when dwelling is heated by community heating.
2 Use linear interpolation between rows of the table.

Table 9: Difference in temperatures between zones

1. *Number in brackets is from the 'control' column of Table 4e.*
2. *HLP is item (38) in the worksheet*

HLP	(1)	(2)	(3)
1.0 (or lower)	0.40	1.41	1.75
1.5	0.60	1.49	1.92
2.0	0.79	1.57	2.08
2.5	0.97	1.65	2.22
3.0	1.15	1.72	2.35
3.5	1.32	1.79	2.48
4.0	1.48	1.85	2.61
4.5	1.63	1.90	2.72
5.0	1.76	1.94	2.83
5.5	1.89	1.97	2.92
6.0 (or higher)	2.00	2.00	3.00

Table 10: Degree-days as a function of base temperature

Base temperature °C	Degree-days	Base temperature °C	Degree-days
1.0	0	**11.0**	1140
1.5	30	**11.5**	1240
2.0	60	**12.0**	1345
2.5	95	**12.5**	1450
3.0	125	**13.0**	1560
3.5	150	**13.5**	1670
4.0	185	**14.0**	1780
4.5	220	**14.5**	1900
5.0	265	**15.0**	2015
5.5	310	**15.5**	2130
6.0	360	**16.0**	2250
6.5	420	**16.5**	2370
7.0	480	**17.0**	2490
7.5	550	**17.5**	2610
8.0	620	**18.0**	2730
8.5	695	**18.5**	2850
9.0	775	**19.0**	2970
9.5	860	**19.5**	3090
10.0	950	**20.0**	3210
10.5	1045	**20.5**	3330

Table 11: Fraction of heat supplied by secondary heating systems

Main heating system	Secondary system	Fraction from secondary
All gas, oil and solid fuel systems	all secondary systems	0.10
Micro-cogeneration	all secondary systems	see Appendix N
Heat pump	all secondary systems	0.10
Electric storage heaters (not integrated) - not fan-assisted - fan-assisted	all secondary systems	 0.15 0.10
Integrated storage/direct-acting electric systems		0.10
Electric CPSU		See Appendix F
Electric room heaters		0.20
Other electric systems		0.10
Community heating	-	0

Notes:

1. *See also Appendix A.*
2. *If an off-peak tariff is present, an electric secondary heater uses the on-peak tariff.*

Table 12: Fuel prices, additional standing charges, emission factors and primary energy factors

Fuel	Additional standing charge, £[(a)]	Unit price p/kWh	Emissions kg CO_2 per kWh	Primary energy factor
Gas:				
mains gas	34	1.63	0.194	1.15
bulk LPG	62	3.71	0.234	1.10
bottled LPG		4.32	0.234	1.10
Oil:				
heating oil		2.17	0.265	1.19
Solid fuel:[(b)]				
house coal		1.91	0.291	1.07
anthracite		1.99	0.317	1.07
manufactured smokeless fuel		2.67	0.392	1.30
wood logs		2.20	0.025	1.10
wood pellets (in bags, for secondary heating)		5.00	0.025	1.10
wood pellets (bulk supply in bags, for main heating)		3.00	0.025	1.10
wood chips		1.60	0.025	1.10
dual fuel appliance (mineral and wood)		2.10	0.187	1.10
Electricity:				
standard tariff		7.12	0.422	2.8
7-hour tariff (on-peak)[(c)]		7.65	0.422	2.8
7-hour tariff (off-peak) [(c)]	20	2.94	0.422	2.8
10-hour tariff (on-peak) [(c)]		7.83	0.422	2.8
10-hour tariff (off-peak) [(c)]	17	4.29	0.422	2.8
24-hour heating tariff	51	4.09	0.422	2.8
electricity sold to grid		3.00[(d)]		
electricity displaced from grid			0.568[(d)]	2.8[(d)]
Community heating schemes:	34			
heat from boilers – gas, oil, solid fuel		1.99	as above[(e)]	as above[(e)]
heat from heat pump		1.99	as above[(e)]	as above[(e)]
heat from boilers – waste combustion		1.99	0.057	1.10
heat from boilers – biomass or biogas		1.99	0.025	1.10
waste heat from power stations		1.39	0.018	1.05
heat from CHP		1.39	as above[(e)]	as above[(e)]
electricity generated by CHP			0.568[(d)]	2.8[(d)]

Energy Cost Deflator[(f)] = 0.91

Notes:

(a) The standing charge given for electricity is extra amount for the off-peak tariffs, over and above the amount for the standard domestic tariff, as it is assumed that the dwelling has a supply of electricity for reasons other than space and water heating. Standing charges for gas and for off-peak electricity are added to space and water heating costs where those fuels are used for heating or hot water.

(b) The specific fuel should be assumed for those appliances that can only burn the particular fuel (including Exempted Appliances within Smoke Control Areas).
Where a main heating appliance is classed as dual fuel (i.e mineral and wood), the data for dual fuel should be used, except where the dwelling is in a Smoke Control Area, when the data for solid mineral fuel should be used.
Wood should be specified as fuel for a main heating system only if there is adequate provision (at least 1.5 m³) for storage of the fuel.
Outside Smoke Control Areas an open fire should be considered as dual fuel and a closed room heater without boiler as burning wood logs.

(c) With certain appliances using an off-peak tariff, some of the consumption is at the off-peak rate and some at the on-peak rate. The on-peak percentages to be used are given in Table 12a, the remainder being provided at the off-peak rate.

(d) Deducted from costs, emissions or primary energy
(e) Take factor from further up the table according to fuel used.
(f) An energy cost deflator term is applied before the rating is calculated. It will vary with the weighted average price of heating fuels in future, in such a way as to ensure that the SAP is not affected by the general rate of inflation. However, individual SAP ratings are affected by relative changes in the price of particular heating fuels.

Table 12a: On-peak fractions for systems using 7-hour and 10-hour tariffs

This table is used for electric space and water heating systems which take electricity at both off-peak and on-peak rates. Use an electricity price for the main heating system weighted between the on-peak and off-peak unit price using the fraction from the table. Secondary heating with fraction according to Table 11 is applied as well.

System	Tariff	Fraction at on-peak rate
Integrated storage/direct acting systems (storage heaters and underfloor heating)	7-hour	0.20
Direct-acting electric boiler	7-hour	0.90
	10-hour	0.60
Ground/water source heat pump:		
water heating with off-peak immersion	7-hour or 10-hour	0.17
water heating without immersion heater	7-hour or 10-hour	0.70
space heating with on-peak auxiliary	7-hour	0.80
	10-hour	0.60
space heating without auxiliary	7-hour	0.70
	10-hour	0.60
Immersion water heater	7-hour or 10-hour	Fraction from Table 13

Table 12b: Solid Fuels

The table shows the fuels that can normally be used on the different types of solid fuel appliance. It should be regarded as only indicative: it is always necessary to follow the appliance manufacturer's instructions. See also section 10.3.3 and note (b) to Table 12 as regards fuel selection for SAP calculations.

	Possible fuels	
Appliance	**Within Smoke Control Area**	**Outside Smoke Control Area**
Auto (gravity) feed boiler	Anthracite grains and beans	Anthracite grains and beans
Manual feed boiler	Anthracite nuts	Anthracite nuts
	Authorised Smokeless	Smokeless
		Wood logs
Wood chip boiler	Wood chips if Exempted Appliance	Wood chips
Wood pellet boiler	Wood pellets if Exempted Appliance	Wood pellets
Open fire (with or without back boiler)	Authorised Smokeless	House coal
		Smokeless
		Wood logs
Closed room heater (with or without boiler)	Anthracite nuts	House coal
	Authorised Smokeless	Anthracite nuts
	Wood logs if Exempted Appliance	Smokeless
		Wood logs
Pellet-fired stove	Wood pellets if Exempted Appliance	Wood pellets
Range cooker boiler	Anthracite	Anthracite
		Wood logs

Table 12c: Distribution loss factor for group and community heating schemes

Heat distribution system	Factor
Mains piping system installed in 1990 or earlier, not pre-insulated medium or high temperature distribution (120-140ºC), full flow system	1.20
Pre-insulated mains piping system installed in 1990 or earlier, low temperature distribution (100ºC or below), full flow system.	1.10
Modern higher temperature system (up to 120ºC), using pre-insulated mains installed in 1991 or later, variable flow system.	1.10
Modern pre-insulated piping system operating at 100ºC or below, full control system installed in 1991 or later, variable flow system	1.05

Note: A full flow system is one in which the hot water is pumped through the distribution pipe work at a fixed rate irrespective of the heat demand (usually there is a bypass arrangement to control the heat delivered to heat emitters). A variable flow system is one in which the hot water pumped through the distribution pipe work varies according to the demand for heat.

Table 13: On-peak fraction for electric water heating

Dwelling total floor area, m^2	Cylinder size, litres						
	7-hour tariff				10-hour tariff		
	110	160	210	245	110	160	210
40 or less	0.12 (0.56)	0.07 (0.18)	0.02	0	0.06 (0.15)	0	0
60	0.14 (0.58)	0.09 (0.21)	0.03	0	0.08 (0.19)	0	0
80	0.17 (0.60)	0.10.(0.24)	0.04	0	0.10 (0.22)	0	0
100	0.19 (0.62)	0.12 (0.27)	0.05	0	0.11 (0.25)	0.00 (0.02)	0
120	0.21 (0.63)	0.14 (0.30)	0.06	0	0.13 (0.28)	0.01 (0.05)	0
140	0.24 (0.65)	0.15 (0.33)	0.06	0.01	0.14 (0.30)	0.02 (0.09)	0
160	0.26 (0.66)	0.16 (0.35)	0.07	0.01	0.16 (0.33)	0.02 (0.12)	0
180	0.27 (0.68)	0.18 (0.37)	0.08	0.02	0.17 (0.35)	0.02 (0.15)	0
200	0.29 (0.69)	0.19 (0.40)	0.09	0.02	0.18 (0.38)	0.03 (0.18)	0
220	0.31 (0.70)	0.20 (0.42)	0.10	0.02	0.19 (0.40)	0.03 (0.21)	0
240	0.32 (0.71)	0.21 (0.43)	0.11	0.03	0.20 (0.41)	0.04 (0.23)	0
260	0.33 0.(72)	0.22 (0.45)	0.11	0.03	0.21 (0.43)	0.04 (0.25)	0
280	0.35 (0.73)	0.23 (0.47)	0.11	0.03	0.22 (0.45)	0.04 (0.27)	0
300	0.36 (0.74)	0.24 (0.48)	0.12	0.03	0.23 (0.46)	0.05 (0.29)	0
320	0.37 (0.75)	0.24 (0.49)	0.12	0.04	0.23 (0.47)	0.05 (0.30)	0
340	0.38 (0.75)	0.25 (0.50)	0.13	0.04	0.24 (0.48)	0.05 (0.32)	0
360	0.38 (0.76)	0.26 (0.51)	0.13	0.04	0.24 (0.49)	0.05 (0.33)	0
380	0.39 (0.76)	0.26 (0.52)	0.13	0.04	0.25 (0.50)	0.05 (0.34)	0
400	0.39 (0.76)	0.26 (0.52)	0.13	0.04	0.25 (0.51)	0.05 (0.35)	0
420 or more	0.39 (0.77)	0.26 (0.52)	0.13	0.04	0.25 (0.51)	0.06 (0.35)	0

Notes:

1) *Table 13 shows fractions of electricity required at on-peak rates for cylinders with dual immersion heaters, and in brackets for cylinders with single immersion heaters, for tariffs providing at least 7 hours of heating per day at the off-peak rate and for tariffs providing at least 10 hours of heating per day at the off-peak rate.*

2) *Alternatively, the fraction may be calculated (for V between 110 and 245 litres) from the following equations:*
   tariffs providing at least 7 hours of heating per day at the off-peak rate
   Dual immersion: [(6.8 - 0.024V)N + 14 - 0.07V]/100
   Single immersion: [(14530 - 762N)/V - 80 + 10N]/100

   tariffs providing at least 10 hours of heating per day at the off-peak rate
   Dual immersion: [(6.8 - 0.036V)N + 14 - 0.105V]/100
   Single immersion: [(14530 - 762N)/(1.5V) - 80 + 10N]/100

   where V is the cylinder volume and N is as defined below Table 1. (If these formulae give a value less than zero, set the on-peak fraction to zero.)

3) *Do not use this table to obtain the on-peak fraction for an electric CPSU. Calculate the on-peak fraction using the procedure described in Appendix F.*

4) *Do not use this table for the on-peak fraction for domestic hot water heated by a heat pump. Use on-peak fraction given in Table 12a.*

Table 14: SAP rating by energy cost factor

ECF	SAP 2005
-3.0	142
-2.5	135
-2.0	128
-1.5	121
-1.0	114
-0.5	107
0.0	100
0.5	93
1.0	86
1.5	79
2.0	72
2.5	65
3.0	58
3.5	51
4.0	45
4.5	39
5.0	34
5.5	30
6.0	25
6.5	22
7.0	18
7.5	15
8.0	12
8.5	9
9.0	6
9.5	3
10.0	1

Note:
Alternatively these formulae can be used:

for ECF >=3.4, SAP 2005 = 111 - 110 $\times \log_{10}$(ECF)

for ECF < 3.4, SAP 2005 = 100 – 13.96 $\times$ ECF

Table 15 : Rating bands

The rating is assigned to a rating band according to the following table. It applies to both the SAP rating and the Environmental Impact rating.

Rating	Band
1 to 20	G
21 to 38	F
39 to 54	E
55 to 68	D
69 to 80	C
81 to 91	B
92 or more	A

Table 16 : Relationship between SAP 2001 ratings and SAP 2005 ratings

Where possible, SAP ratings previously calculated using SAP 2001 should be re-calculated using SAP 2005. The table indicates typical differences between the ratings.

SAP 2001	SAP 2005 for main heating fuel as:				
	Mains gas	LPG	Oil	Solid fuel	Electricity
1	1	(-5)	(-5)	3	3
10	10	5	5	13	13
20	20	16	16	23	22
30	30	26	26	33	32
40	40	36	36	43	41
50	50	45	45	52	50
60	58	54	54	59	58
70	65	61	61	66	64
80	71	67	67	71	69
90	76	72	72	75	72
100	80	75	76	78	75
110	83	77	78	80	77
120	85	79	80	82	78