

Table A1: The water efficiency calculator

Installation type	Unit of measure	(1) Capacity/ flow rate	(2) Use factor	(3) Fixed use (litres/ person/ day)	(4) Litres/ person/day = [(1) × (2)] + (3)
WC (single flush)	Flush volume (litres)		4.42	0.00	—
WC (dual flush)	Full flush volume (litres)	6	1.46	0.00	8.76
	Part flush volume (litres)	4	2.96	0.00	11.84
WCs (multiple fittings)	Average effective flushing volume (litres)		4.42	0.00	—
Taps (excluding kitchen/utility room taps)	Flow rate (litres/minute)	3.5	1.58	1.58	8.73
Bath (where shower also present)	Capacity to overflow (litres)		0.11	0.00	—
Shower (where bath also present)	Flow rate (litres/minute)		4.37	0.00	—
Bath only	Capacity to overflow (litres)		0.50	0.00	—
Shower only	Flow rate (litres/minute)	4.5	5.60	0.00	25.2
Kitchen/utility room sink taps	Flow rate (litres/minute)	4.5	0.44	10.36	20.51
Washing machine	Litres/kg dry load	8.17	2.1	0.00	17.15
Dishwasher	Litres/place setting	1.25	3.6	0.00	4.5
Waste disposal unit	Litres/use	If present = 1 If absent = 0	3.08	0.00	—
Water softener	Litres/person/day		1.00	0.00	—
	(5)	Total calculated use = (Sum column 4)			96.69
	(6)	Contribution from greywater (litres/person/day) from Table 4.6			—
	(7)	Contribution from rainwater (litres/person/day) from Table 5.5			—
	(8)	Normalisation factor			0.91
	(9)	Total water consumption = [(5) – (6) – (7)] × (8)			87.98
	(10)	External water use			5.0
	(11)	Total water consumption = (9) + (10) (litres/person/day)			92.98

Consumption from multiple fittings

A8 Where terminal fittings with varying flow rates and capacities are specified (e.g. hot and cold taps with different flow rates, two types of shower etc.), the average consumption should be calculated as set out in Tables A2.1 to A2.7:

- Enter the full flow rate or volume of each type of fitting into column (a) of the relevant table.
- For taps, where there are separate hot and cold water taps, the flow rate of each tap should be entered separately as two tap types to calculate the average flow rate.
- Calculate the total consumption per fitting type.
- Calculate the average flow rate/volume of the fittings detailed.

- Enter the flow rate/volume of the fitting with the highest flow rate/volume into box (f) with the exception of WCs, where this step is not relevant.
- Calculate the proportionate flow rate/volume by multiplying the highest flow rate/volume by a factor of 0.7 with the exception of WCs, where this step is not relevant.

A9 Where the average flow rate/volume is lower than the proportionate flow rate/volume, the proportionate figure must be entered into Table A1. The proportionate figure limits the flow rate/volume that can be specified to a proportion equal to 70 per cent of the highest flow rate/volume. This reduces the benefit of specifying ultra low fittings to bring the average flow rate/volume down, where such ultra low fittings may not be acceptable to dwellings occupants.

A10 The figure which is the greater of the average or proportionate flow rate/volume should be used. This is so that, where the average flow rate/volume is significantly lower than the highest flow rate/volume specified, the calculation sets a limitation for what figure can be assumed.

Table A2.1: Consumption calculator for multiple taps (excluding kitchen sink taps)

	(a)	(b)	(c)
Tap fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 MIXER	3.5	1	3.5
2			
3			
4			
(d) Total (Sum of all quantities)		1	
(e) Total (Sum of all totals per fitting type)			3.5
Average flow rate (litres/min) = [(e)/(d)]			3.5
(f) Maximum flow rate (litres/min)			3.5
Proportionate flow rate (litres/min) = [(f) × 0.7]			2.45

Table A2.2: Consumption calculator for multiple baths

	(a)	(b)	(c)
Bath fitting type	Capacity to overflow (litres)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 N/A			
2			
3			
4			
(d) Total (Sum of all quantities)			
(e) Total (Sum of all totals per fitting type)			
Average capacity to overflow = [(e)/(d)]			
(f) Highest capacity to overflow (litres)			
Proportionate capacity to overflow (litres) = [(f) × 0.7]			

Table A2.3: Consumption calculator for multiple taps (kitchen/utility room sink)

	(a)	(b)	(c)
Tap fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 MIXER	4.5	1	4.5
2			
3			
4			
(d) Total (Sum of all quantities)		1	
(e) Total (Sum of all totals per fitting type)			4.5
Average flow rate (litres/min) = [(e)/(d)]			4.5
(f) Highest flow rate (litres/min) (litres)			4.5
Proportionate flow rate (litres/min) = [(f) × 0.7]			3.15

Table A2.4: Consumption calculator for multiple dishwashers

	(a)	(b)	(c)
Type of dishwasher	Litres per place setting	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 N/A	1.25	2	2.50
2			
3			
4			
(d) Total (Sum of all quantities)		2	
(e) Total (Sum of all totals per fitting type)			2.50
Average litres per place setting = [(e)/(d)]			1.25
(f) Highest litres per place setting			1.25
Proportionate litres per place setting = [(f) × 0.7]			0.87

Table A2.5: Consumption calculator for multiple washing machines

	(a)	(b)	(c)
Type of washing machine	Litres per kg dry load	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 N/A	8.17	1	8.17
2			
3			
4			
(d) Total (Sum of all quantities)		1	
(e) Total (Sum of all totals per fitting type)			8.17
Average litres per kilogram of dry load = [(e)/(d)]			8.17
(f) Highest litres per kilogram of dry load			8.17
Proportionate litres per kilogram of dry load = [(f) × 0.7]			5.71

Table A2.6: Consumption calculator for multiple showers

	(a)	(b)	(c)
Shower fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 ELECTRIC	4.5	1	4.5
2			
3			
4			
(d) Total (Sum of all quantities)		1	
(e) Total (Sum of all totals per fitting type)			4.5
Average flow rate (litres/min) = [(e)/(d)]			4.5
(f) Highest flow rate (litres/min)			4.5
Proportionate flow rate (litres/min) = [(f) × 0.7]			3.15

A11 Where more than one type of WC is provided, the average effective flushing volume is calculated using Table A2.7 below. The average effective flush volume should then be entered into Table A1 in the row 'WCs (multiple fittings)'.

Table A2.7: Consumption calculator for multiple WCs

	(a)	(b)	(c)
WC type	Effective flushing volume* (litres)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1 DUAL	6	1	6
2			
3			
4			
(d) Total (Sum of all quantities)		1	
(e) Total (Sum of all totals per fitting type)			6
Average effective flushing volume (litres) = [(e)/(d)]			6

* The effective flushing volume for dual flush WCs is:
(full flushing volume (litres) × 0.33) + (part flushing volume (litres) × 0.67)

Ion exchange water softener

A12 Ion exchange water softeners use water in order to clean the resin that is used to absorb the mineral content of the dwelling's water supply. This cleaning process is referred to as the regeneration cycle, which occurs on a frequency dependent on the type of water softener specified and the hardness of the water. The water efficiency calculator looks at the water consumed per regeneration cycle that is beyond a level of good practice. The good practice level has been determined at a level of water consumption as a percentage of the water softener's total capacity which is set at 4 per cent.

A13 The figure entered into the calculator is the volume of water consumed beyond this level of good practice to promote the use of more efficient water softeners. Where the water softener achieves a percentage that is equal to, or lower than this good practice benchmark figure, zero can be entered into Table A1 of the calculator for water softeners. The following formula is used to determine the litres of water consumed per person per day that is beyond the good practice level of 4 per cent.

A14 Litres of water consumed per person per day beyond the 4 per cent good practice level:

$$= [1 - (4 / (a))] \times ((b) \times (c))$$

Where:

(a) = % of total capacity* used per regeneration

(b) = Litres of water consumed per regeneration

(c) = Average number of regeneration cycles per day

*the total capacity is the volume of water that flows through the water softener between regeneration cycles. This volume is dependent on the hardness of the water and the total capacity used in this calculation needs to reflect the hardness of water specific to the geographic location of the specific development. This figure should be determined from manufacturer's product details.

A15 To calculate the litres of water consumed per person per day beyond the 4 per cent good practice level, enter details of the water softener into Table A3. Where the result indicates zero or a negative figure, zero should be entered into Table A1 for water softeners. The number of occupants entered into the table should be based on two in the first bedroom and one in each additional room. Studio flats should assume for two occupants.

Table A3: Water softener consumption calculation *N/A*

(a) Total capacity used per regeneration (%)	
(b) Water consumed per regeneration (litres)	
(c) Average number of regeneration cycles per day (No.)	
(d) Number of occupants served by the system (No.)	
(e) Water consumed beyond 4% (litres/day) = $[1 - (4/(a))] \times ((b) \times (c))$	
(f) Water consumed beyond 4% (litres/person/day) = $[(e)/(d)]$	

Greywater calculations

Greywater demand calculation

A16 Where all WCs and/or washing machines are being supplied with greywater, the consumption values should be copied from Column 4 of Table A1 and entered into Table A4.6 to calculate the greywater savings.

A17 Where greywater is only being supplied to a proportion of fittings such as just to one WC or washing machine, the proportion is calculated by entering details into Tables A4.1 and A4.2.

Table A4.1: Greywater demand calculations – WCs *N/A*

(a)	(b)	(c)	(d)
Effective flushing volume (litres)	Number of fittings present	Quantity using greywater	Greywater demand = $[(a) \times (c)]$
(e) Total fittings = Sum of (b)		(f) Total greywater demand = Sum of (d)	
Average greywater demand from WCs		= $(f)/(e) \times 4.42$	

Table A4.2: Greywater demand calculations – washing machines *N/A*

(a)	(b)	(c)	(d)
Litres per kg	Number of fittings present	Quantity using greywater	Greywater demand = $[(a) \times (c)]$
(e) Total fittings = Sum of (b)		(f) Total greywater demand = Sum of (d)	
Average greywater demand from washing machines		= $[(f)/(e)] \times 2.1$	

Greywater collection calculations

A18 Where greywater is to be collected from all fittings including the shower, bath and wash hand basin taps, the total water consumption of the fittings calculated in Table A1 represents the total greywater collected, the sum of the consumption figures for fittings from which greywater is collected (from column 4 of Table A1) should be entered into Table A4.6. Where greywater is only being collected from a proportion of fittings, such as just some of the taps, the calculations in Tables A4.3 to A4.5 should be followed and the results entered into Table A4.6.

Table A4.3: Greywater collection calculations – taps *N/A*

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total greywater supply = Sum of (d)	
Average greywater supply from taps		= [(f)/(e)] × 1.58 + 1.58	

Table A4.4: Greywater collection calculations – showers *N/A*

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total greywater supply = Sum of (d)	
Average greywater supply from showers (where bath present)		= [(f)/(e)] × 4.37	
Average greywater supply from showers (shower only)		= [(f)/(e)] × 5.60	

Table A4.5: Greywater collection calculations – baths *N/A*

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total greywater supply = Sum of (d)	
Average greywater supply from baths (where shower present)		= [(f)/(e)] × 0.11	
Average greywater supply from baths (bath only)		= [(f)/(e)] × 0.50	

Greywater savings calculations

A19 Where greywater is to be reused within the dwelling, the savings from greywater can be calculated by entering the following details into Table A4.6:

- Calculate the water to be recycled from Table A1 and/or using the method set out in section A18 where just a proportion of fittings are being collected from.
- Determine the percentage of greywater collected to be recycled based upon manufacturer or system designer details of the system specified.
- Determine the water demand of the fittings to be provided with greywater which can include WCs and washing machines depending on the quality of the treated water. This is determined from the WC and washing machine consumption from Table A1 or Tables A4.1 and A4.2 in paragraphs A16 and A17.
- Multiply the volume of water to be recycled with the percentage of recycled water (determined in b. above) which will determine the actual volume of greywater available. Where the greywater supply is greater than the demand, the greywater savings are equal to the demand. Where the demand is greater than the greywater supply, the savings are equal to the supply.
- Enter the greywater saving figure from Table A4.6 into Table A1.

Table A4.6: Greywater collection calculation

N/A

(a)	(b)	(c)	(d)	(e)
Bath, shower and wash hand basin usage (litres/person/day)	Percentage of used water (a) to be recycled (%)	Greywater available for use (litres/person/day) $= (a) \times [(b)/100]$	Greywater demand (litres/person/day) (from Table A1 or A4.2 and A4.3)	Greywater savings (litres/person/day) Where (c) is greater than (d), (e) = (d), otherwise (e) = (c)

A20 Where a communal greywater system is to be provided supplying more than one home, Tables A4.1 to A4.5 can be used in the same way. The figures entered into Table A4.6 need to be entered on an individual dwelling basis and not using figures to reflect the communal system as a whole. The percentage collected figure will, however, need to be based on manufacturer or system designer details of the communal system specified.

Rainwater calculations

Rainwater collection calculations

A21 Where rainwater is to be used, the following calculation method should be followed by entering the relevant details into Table A5.1 or Table A5.2 to calculate the rainwater collection volume.

A22 For Table A5.1 using the intermediate approach from BS 8515:

- Calculate the volume of water collected using the collection area, yield coefficient and hydraulic filter efficiency and average rainfall with guidance from BS 8515.
- Calculate the daily rainwater collection in box (d) using the collection area, yield coefficient, hydraulic filter efficiency and rainfall.
- Enter the number of occupants into box (e), which can be based on two occupants in the first bedroom and one occupant in each additional bedroom. A studio flat should assume two occupants.
- Where a communal rainwater system is to be provided supplying more than one home, Table A5.1 can be used in the same way calculating the total volume collected for the communal system and dividing it by the total number of occupants served by the system. This figure should then be entered in Table A5.5.

Table A5.1: Rainwater collection calculation – BS 8515 intermediate approach

N/A

(a) Collection area (m ²)	
(b) Yield coefficient and hydraulic filter efficiency e.g. 0.7	
(c) Rainfall (average mm/year)	
(d) Daily rainwater collection (litres) $= [(a) \times (b) \times (c)]/365$	
(e) Number of occupants	
(f) Daily rainwater per person (litres) $= [(d)/(e)]$	

A23 For Table A5.2 using the detailed approach as described in BS 8515, enter details of the total daily rainwater collection (litres) and the number of occupants to calculate the daily rainwater per person (litres) and enter into Table A5.5.

Table A5.2: Rainwater collection calculation – BS 8515 detailed approach

N/A

(a) Daily rainwater collection (litres)	
(b) Number of occupants	
(c) Daily rainwater per person (litres) $= [(a)/(b)]$	

A24 The calculation detailed above in Table A5.2 is sufficient for evaluating the principles of the proposed system in the proposed development. However, for sizing of storage capacity and all other design and installation details, BS 8515 should be followed.

Rainwater demand calculations

A25 Where all WCs and/or washing machines are being supplied with rainwater, the consumption should be taken from Table A1 and entered into Table A5.5 to calculate the rainwater savings.

A26 Where rainwater is only being supplied to a proportion of fittings, such as just to one WC or washing machine, the proportion is calculated using Table A5.3 and A5.4. This rainwater demand can then be entered into Table A5.5 to calculate the rainwater savings.

Table A5.3: Rainwater demand calculations – WCs

(a)	(b)	(c)	(d)
Effective flushing volume (litres)	Number of fittings present	Quantity using rainwater	Rainwater demand = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total rainwater demand = Sum of (d)	
Average rainwater demand from WCs		= [(f)/(e)] × 4.42	

Table A5.4: Rainwater demand calculations – washing machines

(a)	(b)	(c)	(d)
Litres per kg	Number of fittings present	Quantity using rainwater	Rainwater demand = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total rainwater demand = Sum of (d)	
Average rainwater demand from washing machines		= [(f)/(e)] × 2.1	

Table A5.5: Rainwater saving calculations for new dwellings

	Litres per person per day
(a) Rainwater collected	
(b) Rainwater demand	
(c) Rainwater savings* = [(a)/(b)] or (b)	

*where the amount collected (a) is greater than the demand (b), the rainwater savings (c) are equal to the demand (b)

Fittings approach

A28 The fittings approach given in G2 uses the methodology described in this appendix to calculate the water consumption of ranges of fittings that meet the performance targets.

Rainwater saving calculations

A27 Enter the total volume of rainwater collected per person per day from Table A5.1 or Table A5.2 depending on the BS 8515 approach followed. Enter the total consumption of fittings using rainwater (demand) from column 4 of Table A1, where rainwater is to be used in all WCs and/or washing machines. Where rainwater is only being used in a proportion of fittings, enter the total demand of WCs and washing machines from Table A5.3 and Table A5.4. This figure should then be entered into Table A1 to calculate the internal water consumption.