Domestic HW cylinder selection guide

These recommendations are based on the guidelines in BS 6700.
Guidance should be sought for unusual applications. e.g.: high flow-rate showers, large baths etc.

Minimum sizes recommended in BS 6700

For storage situations without rapid reheat, an allowance should be made of 45 litre per occupant. This can be reduced to 35 litre per person for 10 to 15+ kW heat pumps on suitably sized heat exchangers. The sizes below are for indirect cylinders with limited stratification and mixing being the heat method within the cylinder.

No of Baths	3 kW HP	6 kW HP	8 kW HP	10 kW HP	15+ kW HP
1 Bathroom	122 litre	88 litre	73 litre	70 litre	70 litre
2 Bathrooms	260 litre	200 litre	131 litre	130 litre	130 litre

Cylinder Sizing Example: a manufacturer produces a range of 90 to 300 litre indirect domestic cylinders in 30 litre between cylinder size capacities up to 210 and then 250 and 300 litre cylinders. The following would be their recommended cylinder sizes

Hot Water Demand	Bedrooms	3 to 6 kW	10 to 15+ kW
1 Standard Bath or Shower	Bedsit / 1 Bed*	150	90
	2 – 3 Bed	180	120
	3 – 4 Bed	210	150
1 Bath and En-suite	2 – 3 Bed	210	150
	3 – 4 Bed	210	150
	4 – 5 Bed	250	180
2 Standard Baths **	2 – 3 Bed	210	180
	3 – 4 Bed	210	180
	4 – 5 Bed	250	210
3 Standard Baths **	3 – 4 Bed	300	250
	4 – 5 Bed	300	250
	5 – 6 Bed	300	300

Please note that these results are based on having a suitably sized heat exchanger which needs to have a greater surface area and/or shape with heat pumps. It is the specifier's responsibility to confirm with the cylinder supplier that the cylinder heat exchanger has the right profile and surface area to meet the necessary performance.

* For a one bed one bath house connected to a 6 kW system, a 120 litre cylinder would provide the required capacity. 150 litres provides some extra bathing capacity; however, this is at the specifiers discretion. All these sizes are selected with this extra bathing capacity in mind.

** A 3 kW HP would need a 300 litre cylinder from this cylinder manufacturer's range to be compliant with BS 6700. This sizing protocol above 2 standard baths applies to 6 kW HP systems.

An 8 kW HP system could use the 10 to 15+ kW range. Less than 8 kW HP system should consider the larger cylinder sizes related to 3 to 6 kW range.

Mathematics behind these cylinder sizes

> *Minutes (M) = (VT)/(14.3P)*

where

   V is the volume of water heated (in litres)
   T is the temperature rise (in °C)
   P is the rate of heat input to water (in kW)

The above formula ignores cylinder heat losses due to short reheat times. A bath is taken as 100 l water at 40 °C or 60 l water at 40 °C blended with 40 l cold water.

Dwelling with 1 bathroom requires first bath of 60 l at 60 °C, 10 l of HW for the kitchen and another bath 25 mins later which can be 70 l water at 60 °C or 100 litres water at 40 °C.

To heat 60 l from 10 °C to 60 °C with 3 kW HP takes (60*50)/(14.3*3) = 70 min so the second bath has to be provided from storage.

Assuming good stratification[1], in 25 minutes, volume of water heated to 60 °C = 14.3*3*25/50= 21 litres.

Therefore, minimum storage capacity to meet requirement is 70 + 60 – 21 = 109 litres[2]

To heat 60 l from 10 °C to 60 °C with 6 kW HP takes (60*50)/(14.3*6) = 35 min so the second bath has again to be provided from storage.

Assuming good stratification, in 25 minutes, volume of water heated to 60 °C = 14.3*6*25/50= 42 litres.

Therefore, minimum storage capacity to meet requirement is 70 + 60 – 42 = 88 litres

To heat 60 l from 10 °C to 60 °C with 8 kW HP takes (60*50)/(14.3*8) = 26.2 min so the second bath has again to be provided from storage.

Assuming good stratification, in 25 minutes, volume of water heated to 60 °C = 14.3*8*25/50= 57.2 litres.

Therefore, minimum storage capacity to meet requirement is 70 + 60 – 57.2 = 73 litres

To heat 60 l from 10 °C to 60 °C with 10 kW HP takes (60*50)/(14.3*10) = 21 min so the second bath requires no storage and the min storage requirement is that to provide first bath & kitchen use i.e. 70 l.

Assuming good stratification, in 25 minutes, volume of water heated to 60 °C = 14.3*8*25/50= 57.2 litres.

Therefore, minimum storage capacity to meet requirement is 70 + 60 – 57.2 = 73 litres

With 15 kW input, storage vol could be reduced to 60 l since while first bath is running, taking about 3 min, the heat input to the water is sufficient to raise 11 l water from 10 °C to 60 °C, so providing for kitchen use. This would be negated by mixing and is not recommended for this work.

If a dwelling has 2 baths, there is a requirement for 130 l draw off at 60 °C (2 baths & 10 l for kitchen) followed by another bath of either 60 l at 60 °C or 100 l at 40 °C after 30 min.

---

1 Mixing rather than stratification is typically realised with an indirect cylinder.
2 122 litres used in table above as indirect cylinder encourages mixing rather than stratification.