



TECHNICAL NOTE

32 Balance tank design for deck-level pools

January 2016

Cryptosporidium

On any deck-level system a balance tank will be incorporated to ensure that the pool water remains at the optimum level for effective surface water removal under all operating conditions. This technical note details PWTAG's recommendations for optimum balance tank specifications.

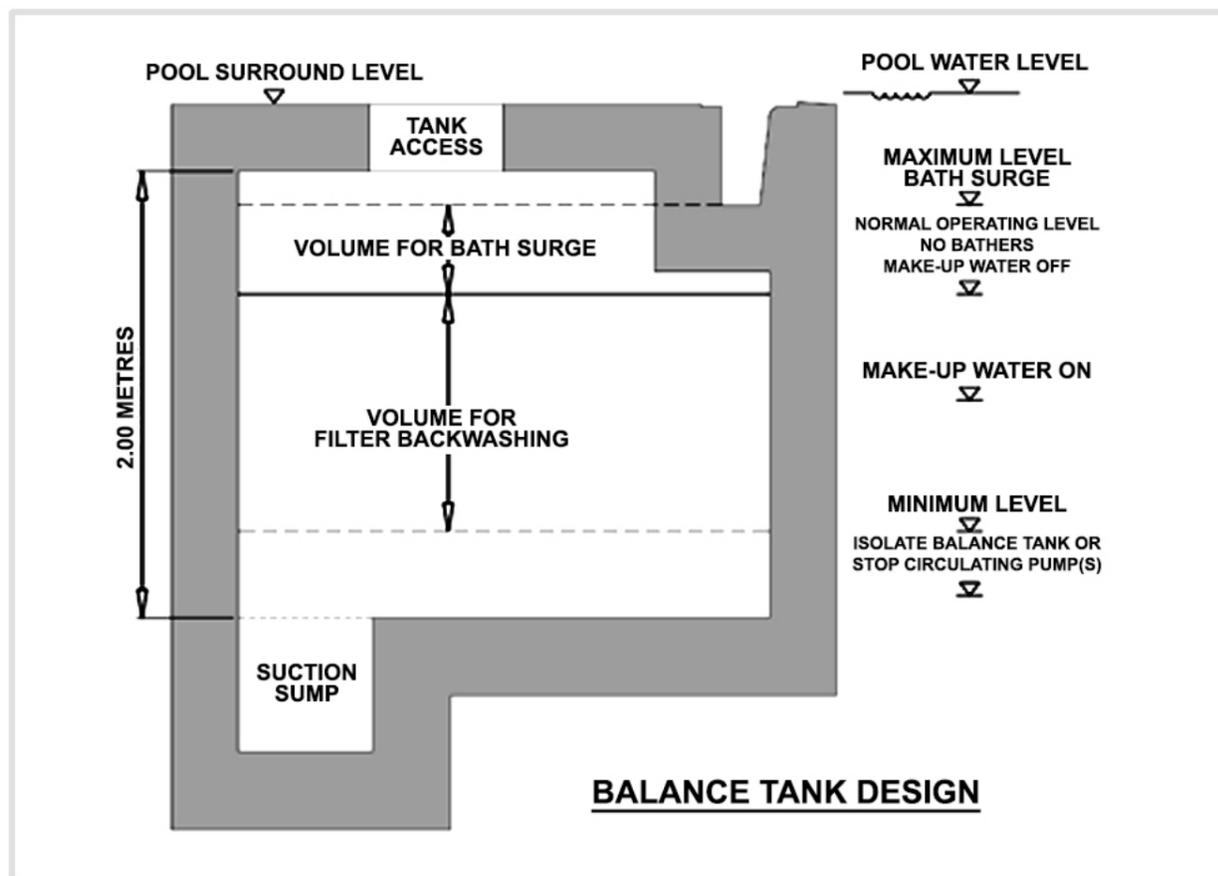
There are three factors that will affect the system operation:

- bather surge displacement
- the volume of water extracted from the pool for filter backwashing
- system hydraulics.

Design criteria

The drawing attached to this document details the three operating levels that must be considered in balance tank design.

- The maximum water level in the tank must be just below the base of the transfer channel around the pool.
- The normal operating level when there are no bathers in the pool and when the surface water system is working at maximum efficiency will extract 50-80% of the circulation system. The extraction system from the balance tank should be sized to take the total circulation rate when the tank is at the maximum level due to bather surge.
- The minimum level takes into account the volume of water required for filter backwashing from the normal operating level and ensures that the pumps can still operate without drawing air. The inclusion of a suction sump in the balance tank enables the minimum level to be as close as possible to the base of the tank.



Volume calculation

Calculating the volume of a balance tank must take into account bather surge and filter backwashing.

Bather surge This value is impossible to calculate precisely as it is affected by the number of bathers and the level of activity in the pool. It is reasonable to base this figure on a minimum of 50% of the instantaneous bathing load and allow 80 litres of displacement per bather. The calculation for the maximum instantaneous bathing load is detailed in the PWTAG code of practice and in its *Swimming Pool Water* (page 40).



TECHNICAL NOTE

Filter backwashing The volume of water extracted from the pool for filter backwashing should be determined by the filter manufacturers. But as a guide this should be based on a backwash rate of 30m/h per m² of filter area for a minimum period of between 5-7 minutes. Ideally on systems where there are multiple filters the volume of water extracted from the pool should be based on washing all filters consecutively. In some installations this is not practicable due to the restrictions on the foul drainage system. Assuming this restriction is in place then the appropriate time can be allowed between washing filters to allow the system to re-fill. In this latter instance the re-fill time should be no longer than four hours.

Additional safeguards

- Incorporating level sensors in the balance tank gives three benefits. The addition of makeup water can be controlled automatically.
- If for any reason the water level falls below the minimum level then the balance tank suction line can either be isolated (assuming the valve incorporates an automatic control valve) or the circulating pump(s) can be stopped to avoid the system drawing air.
- The proportion of water removed from the surface of the pool via the balance tank to that removed from the base outlets can be varied by adjusting the control valves on each of the suction lines. The pipework must be sized to ensure that the total circulation rate to the pool can be extracted either from the base outlets or the balance tank.

Construction and location

Ideally the balance tank should be constructed in concrete as part of the pool construction. The tank should have an internal clearance height of 2m and should be no less than 1.5m at the access from the pool surround area. Allowing these heights can be a challenge – for example when retrofitting a balance tank. But the implications of a height of, say, under 1m are twofold. Cleaning – particularly the top surface – is more difficult. Also, a tank 1m deep would need a footprint almost three times that of a 2m deep tank in order to have the same water capacity.

These figures assume that a suction sump is incorporated; without one, the minimum water depth is increased, thus reducing the operating water depth.

If the tank is over 8m long, it should have an access point at each end. The access covers need to be secured but it is essential that they can be easily removed and replaced. In a basement plant room, side access to the tank can be considered – but this presents a construction risk, as the access point is a large penetration through a water-retaining concrete structure. As the covers must be completely watertight, removing and replacing the bolting arrangement is laborious and time consuming.

There are some instances where the water level in the balance tank will rise to the same level to that of the pool, so the area above the tank should be constructed as a watertight structure.

If a separate GRP (or similar) tank is installed, it should be as close as possible to the pool as the water passes from the pool into the transfer channel and into the tank under gravity flow conditions.