

TECHNICAL DATASHEET

Pool Water Treatment Advisory Group Code of Practice

The Pool Water Treatment Advisory Group Code of Practice (PWTAG) provides pool operators with a detailed plan for the technical operation of their pool by ensuring it meets quality standards that provide a healthy experience for swimmers using recognised and established practices, techniques, engineering and design. For this reason all UK pools are heavily encouraged to follow it.

The Code provides a model of operation based on the authority of PWTAG good practice. Following this code gives an assurance to operators and to the public that the pool meets essential healthy pool operational standards.

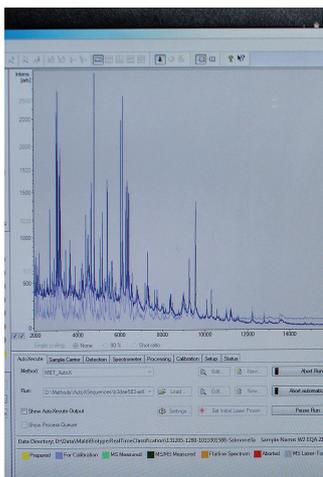
The Code is designed, among other things to meet the health challenge – Cryptosporidium, which is chlorine-resistant. The code is guidance based on the 2009 PWTAG book:

Swimming pool water should be microbiologically analysed on a monthly to monitor for the presence of potentially harmful microorganisms including Cryptosporidium. ALS Environmental are UKAS-accredited and are able to fully assist with the specification listed in these guidance documents.

Microbiology Analysis

Total Viable Count / Aerobic colony count (TVC)

TVC at 37°C (24 hour incubation) is the basic test to assess the quality of the pool water & measure the aerobic bacteria present in the water. This will provide guidance to whether the filtration and disinfection systems are operating satisfactorily. This should not exceed 100 cfu/ml. Results above this are deemed unsatisfactory and consistently elevated colony counts should be investigated.



Escherichia coli (E coli)

Escherichia coli is a bacterium which is normally only found in human and animal faeces which does not grow in water. The presence of E coli indicates the presence of recent faecal contamination & should be absent in a 100ml sample.

Coliforms

Coliforms are related to E coli but may also be found in soil and on vegetation. Their presence indicates some external contamination of the pool water.

Total coliforms should be absent in 100ml.

Less than 10 cfu/100ml is acceptable provided it does not happen in consecutive samples, there are no E coli, the ACC is less than 10 cfu/ml and the residual disinfectant concentration and pH values are within the recommended ranges.

Pseudomonas aeruginosa

Pseudomonas aeruginosa is a pathogen capable of growing in water even at relatively low temperatures. It will readily colonise filters, deck level transfer channels, balance tanks and flexible polymeric materials used in some inflatables, tubing and pool covers. Most species of Pseudomonas are non-pathogenic for healthy people, but Pseudomonas aeruginosa can cause skin rashes and ear infections. It should be absent in a 100ml sample.

If the count is over 10cfu/100 ml, but less than 50cfu/ml, the sampling and analysis should be repeated whilst maintaining the free chlorine and pH values.

Where repeated samples contain Pseudomonas aeruginosa, the filtration, disinfection and cleaning procedures should be examined to determine whether there are areas within the pool system where the organism is able to multiply. Pool equipment e.g. swimming aids, and pool covers may also need to be checked. It can easily colonise water systems, forming biofilms and their presence requires cleaning and disinfection with a 50mg/l free chlorine solution.

When counts exceed 50cfu/100 ml pool closure is advised as there is significant risk of bather infection.

ALS Environmental can provide microbiological and Legionella analysis and were one of the first UK laboratories to validate and UKAS ISO 17025 accredit the rapid identification of positive Legionella and Microbiological samples by Matrix Assisted Laser desorption and Ionisation by Time of Flight (MALDI-ToF) Mass Spectrometry. This technique allows us to remove the need for presumptive data for Legionella and all other bacteriological analysis, with all data reported as Colony Forming Units (CFU) with a full speciation in over 98% of instances.

Chemical testing of pool water

Where disinfection and pH are not monitored and controlled automatically by the water treatment plant, manual testing is required using commercially available test kits and the appropriate tablets. The frequency of chemical testing is usually determined by the risk assessment. Automatic control does not monitor combined chlorine to ensure adequate control of chloramines, chemical testing may need to be more frequent.

The recommended chemical test intervals are:

- Before the pool opens.
- Every two hours while it is open.
- After it closes.

Pool water samples for chemical analysis should be taken from the pool at a depth of 100-300mm (not from the sampling cell in the automatic monitoring equipment). They should routinely be taken at the deep end and furthest away from the inlets along with the most vulnerable part of the pool.

Free chlorine levels

These values require validation by satisfactory bacteriological water quality standards. For pools using hypochlorite, assuming the pH value is 7.2, the free chlorine levels should be maintained at 1mg/l or below with an absolute minimum of 0.5mg/l. This assumes the pool has satisfactory microbiological monitoring results.

The use of secondary disinfection (UV or ozone) can help minimise the free chlorine levels. These values can only be achieved where the pool is designed, engineered and operated well with effective pre-swim hygiene and is not overloaded.

Upper limits

Free chlorine levels above 3mg/l should not be present in any pool using hypochlorite. If this is exceeded, dosing should be reduced.

If dosing has gone wrong and free chlorine reaches 5mg/l, chlorination should be stopped immediately. If free chlorine continues to rise, bathing should cease until the fault has been resolved and the residual free chlorine is under control.

Combined chlorine levels

The level of combined chlorine residuals should be as low as possible. Combined chlorine levels should be less than half the free chlorine, and no more than 1mg/l irrespective of the level of free chlorine.

If the ratio of combined chlorine to free chlorine is unsatisfactory, some correction may need to be applied.

pH value

The pH values for the pool water should be maintained within the range recommended for the disinfectant being used. But a pH value of between 7.2 and 7.4 should be the target when using chlorine-based disinfectants. At levels above this range the free chlorine will not be so effective and may need to be increased.

Alkalinity

To ensure effective coagulation and a stable pH when using acidic disinfectants, alkalinity in pool water should be maintained at a level between 80 and 200mg/l (measured as CaCO₃).

Alkalinity measurements should be taken weekly, using commercially available alkalinity test kits and using appropriate tablets. Dilution or dilute acid should be used to lower the levels of alkalinity in the pool water.

Calcium hardness

Pool water should be maintained for bather comfort, and the grout in the pool should withstand that water. Ideally calcium hardness should be maintained between 75 and 150mg/l as CaCO₃.

However, in areas with a hard water supply this cannot be practically achieved. It is therefore very important that water treatment chemicals do not further increase the calcium hardness values over and above that in the hard water make up supply.

Calcium hardness concentrations greater than 300mg/l may result in the deposition of scale causing sudden changes in temperature and pH. Calcium hardness measurements should be taken weekly, using commercially available test kits with the appropriate tablets.

Total dissolved solids (TDS)

Dissolved solids are destructive at high levels and should never be allowed to rise more than 1,000mg/l greater the level in the source water. The TDS concentration should be reduced by dilution if necessary and should be measured weekly, using a commercially available electronic meter that has been calibrated against a commercially available standard.

Sulphates

Sulphate levels should be maintained below 360mg/l and should be measured once a week using a commercially available test kit.

Balanced water

It is important to maintain the water in balance and this is usually achieved when the pH is properly controlled. Alkalinity, Calcium hardness, TDS and temperature are also factors.

The Langelier index is a formula that brings together all these factors. It makes sense to calculate Langelier weekly when measuring Alkalinity, Calcium hardness and TDS.



Reference

https://www.pwtag.org.uk/knowledge/code_of_practice.php