POOL WATER TREATMENT ADVISORY GROUP

Hydrotherapy Pool Technical Operator

SYLLABUS AND ASSESSMENT – v1 01.11.20

Hydrotherapy Pool Technical Operator Syllabus

People studying for PWTAG-approved Hydrotherapy Pool Technical Operator qualification should be taught according to this syllabus

THEORY

1. **What is a hydrotherapy pool?**
    a. Types of pool and uses
    b. Types of pool tank and finish
    c. How swimming pools work – the recirculation cycle:
        - circulation system
        - filtration
        - chemical disinfection

2. **Pollution and hygiene**
    a. Pollution from bathers – why people are the main source of pollution bathers:
        - skin scales, sweat, urine, mucus from the nose and chest, saliva, hair, faecal matter, cosmetics, suntan lotion
    b. Pollution not from bathers
        - dust, floating debris, grass, dirt (soil/stones) precipitated chemicals, sand from filters, byproducts of chemical treatment
    c. Pre-swim hygiene: - toilets and showers
    d. When not to access the hydrotherapy pool – exclusion policies
    e. Babies and toddlers – swim nappies

3. **Management, health and safety regulation and training**
    a. Staffing structure and management systems – their impact on water quality
    b. Health and Safety – the legal requirements
    c. Department of Health Guidance HTM 04-01 - Water Safety Plan (WSP)
    d. Water Safety Group (WSG).

e. HSG 179 – the written procedures (PSOP and method statement)
f. COSHH – substances hazardous to health in a pool, chemicals and microorganisms
g. Confined spaces regulations – and their application
h. O&M manual and schematic drawing
i. Training – who, when and how much is needed (Designated aquatic therapist)
j. PWTAG Code of Practice – Swimming Pool Technical Operations' role in written procedures

4. Design

a. Design issues impacting on water quality
b. Awareness of BS EN 15288 1 & 2, the design, management and operation of swimming pools
c. Changing rooms:
    - toilets and showers
    - baby changing facilities
    - floors in wet areas
d. Safe access – including people with disabilities
e. The plant room – location, size and access
f. Chemical store
g. Temperature and humidity
h. Energy management

5. Hydraulics and water circulation

a. Bather load – calculating the factors for safety and water quality
b. Circulation rate – calculations
c. Turnover period – calculations and alignment with PWTAG standards
d. Hydraulic design – different design solutions
e. Surface water removal – focusing on removing pollution:
    - deck-level
    - channels
    - skimmers
f. Balance tanks – purpose, design and maintenance
g. Outlet and inlet safety – the entrapment: PWTAG Code of Practice, BS EN 13451–1 and 3
h. Moveable floors and booms – effects on hydraulics and water quality
i. Circulation pumps – the principles, variable speed drives
j. Valves – types, uses and safe operation
k. Flow meters and pressure gauges – calibration, maintenance
l. More than one pool – separate treatment systems
m. Dye testing – why and when

6. **Filtration**

    a. Clarity of water – importance
    b. Filtration rates – pros and cons:
        - Clarity of water – importance
        - Filtration rates – pros and cons:
    c. The sand bed – grades and depths
    d. Underdrains – how they work, how they are best constructed
    e. Other types of filter:
        - bags and cartridges
        - pre-coat
        - carbon
        - glass
        - membrane
        - zeolite
    f. Backwashing – the principles:
        - how to backwash, fluidisation of the bed, air scour, the rinse cycle
        - strainer basket – part of the process
        - when to backwash – PWTAG Code of Practice and other guidance
    g. how to backwash, fluidisation of the bed, air scour, the rinse cycle
    h. strainer basket – part of the process
    i. when to backwash – PWTAG Code of Practice and other guidance
        - how it works – agglomeration and flocculation
        - high-rate filters – and coagulants
    j. Coagulants:
        - dosing – quantities and rates
        - injection – where to apply

7. **Primary disinfection**

    a. Suitability and compatibility of disinfection types
    b. What is disinfection – in a hydrotherapy pool setting
    c. Oxidation – how it's important
    d. CT rates – an understanding
    e. Choosing a primary disinfectant – chlorine, hypochlorite, chlorinated isocyanurates, (soft water, hard water, costs and impurities)
    f. The chemistry of chlorine disinfection – an understanding:
        - how chlorine forms a residual – hypochlorous acid and hypochlorite ion
        - the effects of pH on disinfection – the values to pursue and why
        - breakpoint chlorination – understanding its crucial role

- chlorine plus ammonia – urea, chloramines
- nitrogen trichloride – its causes and effects
- organic chloramines –causes, effects and removal

k. Free and combined chlorine – the relationship and target levels
l. pH value – its influence on disinfection and the options
m. Electrolytic generation of chlorine –systems and applicability
n. Chlorinated isocyanurates – when and how to use:
    - cyanuric acid – awareness of influence of residuals; outdoor pools
    - residual values – PWTAG guidance
o. Bromine based disinfectants – what and why
p. Other forms of residual disinfection and new treatments
q. The importance of dilution – why disinfection and filtration is not enough

8. Secondary disinfection

a. When secondary disinfection should be considered
b. The effects of secondary disinfection
c. Dealing with Cryptosporidium
d. UV – what it is, how it is applied, maintenance and monitoring, pros and cons
e. Ozone – what it is, how it is applied, maintenance and monitoring, pros and cons

9. Dosing chemicals

a. Principles – key requirements
b. Components – the system design and infrastructure
c. Dosing practice – where, when and how
d. Hand dosing in emergencies
e. Diluting chemicals – how and when to dilute
f. Dissolving dry chemicals
g. Dose strength – calculations
h. Day tanks – use, construction and fittings
i. Dosing pumps – type, construction and capacity
j. Pipework – construction and application
k. Valves and fittings – that may be incorporated into the dosing system
l. Calibration – checking the dosing rate
m. Faults – fail-safe systems
n. Automatic control – optimising dosing treatment:
    - closed loop – how the control works
    - sample mixing – representative sample
    - sampling – where to sample from
    - calibration – independent analysis of the sensor to verify the desired effect

- sensors – amperometric, redox, pH value
- controllers – the levels of sophistication

o. Circulation feeders – what they are and how they work:
- trichlorinators
- brominators
- calcium hypochlorite

p. CO2 installation and dosing requirements
q. Superchlorination

10. Pool water chemistry

a. Source water quality
b. Alkalinity – the effect on pH
c. Hardness – PWTAG guidelines, grout and scale
d. Dissolved solids – Corrosion, erosion and PWTAG guidelines
e. Water balance – what it is and why it doesn't matter
f. Disinfection byproducts – the health effects:
- nitrogen trichloride – effects, monitoring and mitigation
- THMs – monitoring and removal

11. Testing and controlling pool water chemistry

a. Comparator and photometer, electronic meters, their test principles, advantages and disadvantages, the need for routine in house and external annual calibration and how to use the test equipment , labelling vials for each test, cleaning, using the correct tablets, never handling tablets, correct sample size
b. Sampling points:
- from the pool at the weakest point
- 100-300mm below surface

c. Main parameters (minimum requirement):
- free chlorine/total bromine
- total and combined chlorine
- pH
- temperature
- total dissolved solids

d. Supplementary parameters (as required):
- cyanuric acid
- sulphate
- turbidity

e. Control measures:
- testing frequency
- interpreting test results and remedial actions for all tests in C.
- PWTAG Code and recommended standards for all parameters tested in C.

- understanding breakpoint chlorination and effects of free chlorine on chloramines
- the consequences of free chlorine and chloramines being out or range
- pH value – effects on bathers and disinfection (alkaline disinfectants – effect on pH, acidic disinfectants – effects on pH

f. As required:
- cyanuric acid – its effect on chlorine release
- turbidity using the right meter

g. Documentation and record keeping and storing test results:
- records must be kept for a minimum of 5 years in accordance with COSHH
- the importance of a circular audit trail – recognition of parameter being out of spec, action taken and evidence to show it has been corrected
- the importance of supervisory sign off

h. Dilution testing

12. Healthy use of the hydrotherapy pool – the health risks

a. Infectious hazards, including transmission:
- gastrointestinal infections – Shigella, Escherichi coli, Cryptosporidium
- foot infections – verruca and athlete's foot
- skin infections – molluscum contagiosum, Staphylococcus aureus and MRSA
- eye infections – including Acanthamoeba

b. Non-infectious hazards:
- respiratory irritation – including Legionella and asthma
- skin irritation – bromine, Pseudomonas aeruginosa, folliculitis
- ear infections ¬ including otitis externa

13. Preventing outbreaks

a. What goes wrong – definition of an outbreak
b. Problems that have lead to outbreaks
c. Dealing with a faecal incident – The PWTAG Code of Practice, technical note and NHS UK Cryptosporidium Reference Unit: Guidance for Investigators and Health Professionals:
- solid faeces
- runny faeces
- procedure for medium-rate filters
- procedure for high-rate filters
- procedure for pre-coat filters

- prevention
- blood and vomit

14. Microbiological testing

a. Sampling – must be weekly and include chemical tests
b. Aerobic colony counts (TVC)
c. Coliform and E coli – potential faecal or environmental pollution
d. Pseudomonas aeruginosa – the reasons for testing
e. Legionella – quarterly for pool due to higher risk groups, testing for spas, showers and water storage
f. Test requirements – weekly analysis
g. Interpreting results – assessing microbiological quality
h. Remedial action
i. Gross contamination and closure of the pool
j. Quality assurance

15. Pool chemical safety

a. Safety data sheets – provision and use
b. Risk and COSHH assessment – the process and elimination
c. Delivery:
    - access
    - unloading
d. Bulk deliveries and storage
e. Transporting chemicals
f. The chemical store
    - siting
    - fire risk
    - spillage
    - ventilation
g. Storage of disinfectants and other chemicals including:
    - sodium hypochlorite
    - calcium hypochlorite
    - BCDMH
    - chlorinated isocyanurates
    - sodium bisulphate
    - CO2
    - hydrochloric acid
    - sulphuric acid

16. Plant maintenance

a. Servicing and frequency
b. Calibration
c. Daily monitoring and maintenance, fault finding

17. Cleaning and hygiene

a. Floor surfaces – dirt, slips trips and falls and bacteria
b. Around the pool – PWTAG technical note
c. Scale removal
d. Pool covers – cleaning both sides to control mould and Pseudomonas aeruginosa
e. Transfer channels and balance tanks – regular maintenance
f. The pool bottom – particularly deck-level pools
g. Moveable floors and booms – the need to clean under structures
h. Stainless steel – preventing corrosion
i. Inflatables and swimming aids – prevention of Pseudomonas aeruginosa
j. Safeguarding the fabric of the building – preventing steel corrosion cracking, pool grout, filling and emptying pools
k. Algae

18. PPE and plant room emergency procedures

a. The regulations – assessment, provision and use
b. Harmful effects – the potential risks to health from chemical exposure
c. PPE – what to use and when, use of safety data sheets
d. In an emergency – what to do for chemical contact/inhalation/ingestion
e. Emergency showers and eye baths
f. Toxic gasses, fires and explosions
g. Spillages – PWTAG Code of Practice and technical guidance (sodium hypochlorite)
h. PWTAG Code of Practice and emergency procedures – chemicals emergency part of the EAP

19. Theory assessment exam

A multiple choice exam shall at a minimum cover a fair representation of the essential topics as outlined in the theory element of the syllabus (above)

20. The hydrotherapy pool practical test

There are four basic areas of practical ability that can be taught in any suitable location, and should then be assessed in the student's workplace, as part of the exam

1. **Doing a full set of water tests for pool water**
   This should include:
   - free chlorine

- total and combined chlorine
- pH
- total alkalinity
- calcium hardness
- total dissolved solids (TDS)

2. **Drawing a schematic diagram of the layout of a hydrotherapy pool plant**
   This should indicate clearly (using arrows to indicate the direction of flow) each of the main components, including:
   - filters
   - pumps
   - strainers
   - automatic dosing units
   - monitoring equipment
   - main valves

3. **Demonstrate how to backwash the filtration system**
   This should be of a chosen hydrotherapy pool, in accordance with normal operating procedures. It should include an explanation of why and when this must be carried out.

4. **Making a risk assessment for one pool chemical**
   This should refer to a chemical stored in the plant room of a chosen hydrotherapy pool. It should include identifying the requirements for storage, handling and use of the chemical.

21. Assessment

Documentation of these tasks shall be provided to the manager, who must sign them off to show that they are based upon the hydrotherapy pool used in the assignment. The PWTAG Accredited Trainer course organiser will assess the evidence presented and determine if the student has demonstrated sufficient knowledge and practical skills and provide this as part of the assessment record.