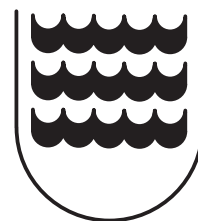


Management of public swimming pools — Water treatment systems, water treatment plant and heating and ventilation systems — Code of practice

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Foreword

While drinking water and even coastal waters are subject to regulation in the UK, there is no equivalent specific regulation for the control of swimming pool water quality.

PAS 39 has been prepared at the request of the Pool Water Treatment Advisory Group (PWTAG). PAS 39 is a Code of Practice based on PWTAG's document *Swimming pool water treatment and quality standards* (PWTAG 1999). The PWTAG publication gives more comprehensive guidance than this Code of Practice, including details of how to improve water quality in pools where conventional disinfection is inadequate.

This PAS Code of Practice is not to be regarded as a British Standard.

Acknowledgement is given to the following organizations who were consulted in the development of this specification:

- The Institute of Sport and Recreation Management (ISRM);
- The Pool Water Treatment Advisory Group (PWTAG);
- The Health Protection Agency;
- The Swimming Pool and Allied Trades Association (SPATA).

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This publication does not purport to contain all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this Code of Practice does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 23 and a back cover.

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1 Scope

This Code of Practice contains general operational and safety recommendations for the management of public swimming pool water treatment systems, water treatment plant, and heating and ventilation systems in the UK.

This Code contains a number of examples, many of which refer to the use of chlorine-based disinfectants, which are in common use in the UK at present. This however is not intended to preclude the use of other disinfection methods (see 5.2.5).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Code of Practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references the latest edition of the publication referred to applies.

BS EN 13451-3, *Swimming pool equipment — Part 3: Additional specific safety requirements and test methods for pool fittings for water treatment purposes*.

BS EN ISO 6222, *Water quality — Enumeration of culturable micro-organisms — Colony count by inoculation in a nutrient agar culture medium*. (BS 6068-4.5)

Swimming pool water treatment and quality standards, Pool Water Treatment Advisory Group 1999 (ISBN 0 951 70076 6).¹⁾

3 Terms and definitions

For the purposes of this Code of Practice the following terms and definitions apply.

3.1

bathing load

number of people in the pool

3.2

combined chlorine

measure of the chloramines (by-products of chlorine and ammonia)

3.3

circulation rate

flow of water measured in m³/h to and from the pool through the pipework and treatment system

3.4

deck-level

a pool with the water and poolside deck at the same level, and having a perimeter gutter to remove surface water

3.5

headloss

difference in water level between the upstream and downstream sides of a treatment process attributed to friction losses

NOTE Sometimes called “pressure drop”.

3.6

turbidity

reduction of transparency of a water caused by colloidal or particulate matter in suspension

¹⁾ This publication can be obtained from the Pool Water Treatment Advisory Group (PWTAG), Field House, Thrandeston, Diss, Norfolk, IP21 4BU, United Kingdom. Phone: 01379 783678 Fax: 01379 783865. Email: guthrie@pwtg.org

3.7

turnover period

time taken for a volume of water equivalent to the entire pool water volume to pass through the treatment plant and back to the pool

3.8

nephelometric turbidity unit (NTU)

unit of measure used in the measurement of turbidity by instrumentation

3.9

public pool

any non-domestic pool, e.g. local authority pool, community pool, school pool, hotel pool, club pool, etc.

3.10

filtration

removal of colloidal or particulate matter by passing the pool water through a filter media, usually a sand bed

3.11

coagulation

use of materials called flocculants or coagulants to enhance the removal of dissolved, suspended or colloidal matter by improving the filtration efficiency

3.12

disinfection

process of minimizing potentially harmful micro-organisms in pool water

4 Management system

4.1 General requirements

UK law stipulates that swimming pools should be managed in accordance with the Health and Safety at Work etc. Act [1] and the Management of Health and Safety at Work Regulations 1999 [4]. This Code of Practice provides practical advice on ways to comply with the law relating to the management of health and safety in swimming pools and, in particular, those aspects concerned with pool water treatment.

4.2 Management responsibility

4.2.1 Policy

Senior management (those who are legally responsible) should define and document a policy for the general operation and safety of swimming pool water treatment systems.

Senior management should ensure that this policy is communicated, implemented and maintained throughout the organization.

4.2.2 Management review

Senior management should review the swimming pool water treatment system, the pool hall ventilation system and the pool hall heating system, in principle, continuously, and formally at planned intervals, e.g. at least annually, to ensure its continuing suitability, adequacy and effectiveness.

This review should include assessing opportunities for improvement and the need for changes to the swimming pool water treatment system, including the policy.

Inputs to the management reviews should include:

- a) feedback from bathers or other users of the pool, suppliers, regulators, regulatory authorities or other external parties;
- b) information on the performance of the water treatment systems (see 4.3);
- c) status of preventive and corrective actions;
- d) information on any incidents or emergencies;
- e) follow-up actions from previous management reviews;

- f) changes that could affect the swimming pool water treatment system, including any changes in regulations or national standards; and
- g) recommendations for improvement.

Outputs from the management reviews should include any decisions and actions related to improvement of the effectiveness of the swimming pool water treatment system and its processes.

Records from management reviews should be maintained (see 4.2.2).

4.3 Measuring, monitoring, analysis and improvement

The effectiveness of the procedures and the operation of the water treatment and management system should be measured, monitored and analysed on a regular basis, to identify opportunities for improvement.

As a minimum, senior management should monitor the performance of their pool operation through:

- a) assessments of individual and overall operations performance;
- b) control of non-conformance to operational plans, procedures and performance requirements;
- c) corrective and preventive actions;
- d) responding to incidents or other emergencies; and
- e) any feedback from bathers or other users of the pool, suppliers, regulators or other external parties.

4.4 Training, awareness and competence

The management of the swimming pool should identify all training needs. It should require that all personnel whose work is concerned with the swimming pool water treatment system have received appropriate training.

The management should establish and maintain procedures to make its employees or members at each relevant function and level aware of:

- a) the importance of conformance with the swimming pool management system policy and procedures, and with the requirements of the swimming pool management system;
- b) the significant operational or safety impacts, actual or potential, of their work activities and the benefits of improved personal performance;
- c) their roles and responsibilities in achieving conformance with the policy and procedures and with the requirements of the swimming pool management system, including emergency preparedness and response requirements; and
- d) the potential consequences of departure from specified operating procedures.

Personnel performing tasks with significant operational or safety impacts should be competent on the basis of education, appropriate training and/or experience.

Personnel performing water quality tests (see 5.5) should be able to distinguish different colours, as the analysis of the results of such tests involves this ability (unless photometers are provided).

4.5 Emergency preparedness and response

Management should establish and maintain procedures to identify potential for, and response to, accidents and emergencies, and for preventing and mitigating any possible operational and safety impacts.

Management should, where necessary, review and revise its emergency preparedness and response procedures, in particular, after accidents and emergencies.

Where practicable, the emergency procedures should be tested periodically.

4.6 Non-conformance and corrective and preventive action

The senior management should establish and maintain procedures for defining responsibility and authority for:

- a) handling and investigating non-conformance;
- b) taking action to mitigate any impacts; and
- c) initiating and completing corrective and preventive action.

Any corrective or preventive action taken to eliminate the causes of actual and potential non-conformances should be appropriate to the magnitude of problems and commensurate with the impact encountered.

The organization should implement and record any changes in the documented procedures resulting from corrective and preventive action.

4.7 Swimming pool management system documentation and records

4.7.1 General

The organization should establish and maintain information, in paper or electronic form, to

- a) describe the core elements of the management system and their interaction; and
- b) provide direction to related documentation.

4.7.2 Documentation

The management system should contain or refer to the following documentation:

- a) an organization chart showing lines of authority, responsibility and allocation of functions stemming from senior management;
- b) the policy;
- c) procedures covering the operation and safety of the swimming pool water treatment systems, heating systems and ventilation systems;
- d) procedures covering the identification of non-conformances against clauses of this Code of Practice and action to be taken to resolve such non-conformances; and
- e) emergency action procedures (EAPs).

It is imperative that senior management ensures the effective implementation of all documented procedures and instructions.

4.7.3 Records

A record system should be established to suit particular circumstances.

It is important that records:

- a) demonstrate that procedures have been effectively used and implemented;
- b) demonstrate compliance under the relevant clauses of this Code of Practice;
- c) demonstrate that where compliance with clauses cannot be met appropriate risk analysis methods have been applied to determine the safety of the system;
- d) demonstrate that appropriate means have been applied to ensure identified risks have been minimized and are within legally established safety limits;
- e) demonstrate that relevant and adequate training has been provided for all staff involved in the safety and operation of swimming pool water treatment systems, heating systems and ventilation systems;
- f) be identified, managed and disposed of in such a way as to ensure the integrity of the process and confidentiality of the information; and
- g) be kept for a period of time so that continued confidence may be demonstrated for a period of at least five years.

5 Water treatment

5.1 General

Water treatment systems are an integral part of the architectural, structural and mechanical design of a swimming pool. The design, selection and operation of swimming pool water treatment plant has to take the following factors into account:

- a) mains water quality, dilution and drainage, coagulation, filtration and disinfection;
- b) bathing load, circulation rate, circulation hydraulics and turnover period; and
- c) pool operation, water treatment system and plant room.

Pool operators should be aware of the HSE Code of Practice on *Legionella* [2].

5.2 Mains water quality

5.2.1 Mains water

The water companies' treatment processes provide a safe water but, especially if from a river or reservoir (surface waters), are likely to contain some or all of:

- a) organic materials, including humic acid (a precursor of the undesirable chlorination by-products, trihalomethanes, which themselves may be present);
- b) lime and other alkalis (added to prevent corrosion in the supply network);
- c) phosphates (added to prevent lead dissolving from pipework, but which encourage algal growth in the pool); and
- d) other substances at levels which, if boosted by pool water treatments, may take the levels above recommended safe limits.

So it is essential that there is careful monitoring of a pool's disinfection, pH, total alkalinity, calcium hardness, total dissolved solids and filtration.

In general, the importance of a balance between public health demands and consumer acceptability applies to both drinking and swimming waters. Disinfection cannot be compromised, but can be aimed towards minimizing both disinfectant levels and the formation of unwanted substances, including disinfection by-products. Dilution is an important factor in this process.

5.2.2 Source water monitoring

Pool operators should determine, monitor and record the characteristics of the source water they are using, including any likely variation in source.

All water suppliers are required by statutory regulations to maintain a public record of the quality of water supplied to each water supply zone. This includes the results of analyses. Users are entitled to inspect the record and have a free copy of it for their water supply. They should, however, also ask water suppliers for details of likely changes in the future.

5.2.3 Filtration

5.2.3.1 General

Effective filtration is the main guarantee of good water clarity, which is important for the safety and comfort of bathers.

Effective filtration should ensure that water clarity is good enough to allow unclouded or clear sight of the bottom of the pool at the deep end.

The water turbidity should not exceed 0.5 NTU (nephelometric turbidity units).

5.2.3.2 Sand filters and filter rate

Filters will usually be of the sealed, pressurized type, utilizing sand as the main filter medium and a coarser, secondary filter medium (particles larger than 0.5 mm).

For "single-grade" filters the sand bed should be a minimum of 800 mm deep; for "multi-grade" filters the sand bed should be a minimum 550 mm deep supported on a bed of coarser material.

It is important to inspect the condition of the filters and the top of the sand bed annually.