



Technical Guidance on the Management of Swimming Pools and Swimming Pool Plant on School Sites

CONTENTS

1.0 MANAGEMENT OF SCHOOL SWIMMING POOLS

1.1 Introduction

1.2 Responsibilities for the Health and Safety of Swimming Pools in Schools

The Headteacher

The Pool Plant Operator/The Pool Carer

Training for Pool plant Operators/Pool Carer's

Upgrading School Swimming Pools and Swimming Pool Plant

2.0 THE SWIMMING POOL

2.1 The Swimming Pool Hall

2.2.1 Lighting Requirements

General Lighting

Emergency Lighting

Specialised Lighting in Hydrotherapy Pools

2.1.2 Fire Safety

Fire Risk Assessment

Fire Exit Signs

Fire Alarm Call Points

Heat and Smoke Detection

2.1.3 Environmental Conditions

Ventilation

Temperature and Humidity

2.2 The Swimming Pool Surroundings

2.2.1 The Pool Structure

Walls
Glazing
Ceilings
Floor and Finishes
Drainage Gullies
Steps
Heaters/Radiators/Guarding
The Pool Surround (Outdoor Seasonal Pools)

2.2.2 Emergency Equipment and other Equipment

Pool Emergency Alarm
Swimming Pool First Aid Kits
Storage of Pool Equipment

2.2.3 Pool Signage

Signage on Outside of Pool Compound
Signage Inside of Pool Hall or Pool Compound
Depth Signs
Pool Profiles
Maximum Bather Load

2.2.4 Security

Pool Security
Security Fencing and Gates (Outdoor Seasonal Pools)

2.2.5 Showers

Disinfecting of Shower Heads

2.2.6 Pool Thermal Insulation Covers

Pool Covers
Selection of Pools Covers

2.2.7 Exceptional Weather Conditions

Heat Waves and Exceptionally High Temperatures
Adverse Weather Procedures (Outdoor Pools and Covered Pools with No Artificial Light)

2.2.7 Showers

Shower Head Disinfection

2.3 The Swimming Pool

2.3.1 The Swimming Pool Tank

The Pool Tank Depth
Pool Tank Edges
Pool Tank Details
Pool Tank Bottom

2.3.2 Accessing and Exiting the Pool

Access to Pool Tank
Pool Steps and Ladders
Moveable Floors
Pool Hoists
Design of Ramps

2.3.3 Swimming Pool Inlets and Outlets

Swimming Pool Inlet and Outlet Safety
Pool Inlets
Size of the Aperture of Outlets Grills
Prevention of Vacuum Entrapment
Outlet design and Installation
Supervision of Pool Users
Skimmers

2.3.4 Keeping the Swimming Pool Clean

Pool Cleaning
Pool Cleaning Brushes
Pool Vacuums
Pool Nets
Cloudy Pool Procedure (All Pools)

2.3.5 Emergency Equipment

Rescue Poles
Thermal Blankets for Emergencies

2.3.6 Hydrotherapy Pools

Disinfection
Bromine Itch
Maintaining Good Water Quality
Filtration
Balance Tanks

2.3.7 Pollution from Bathers

Different Types of Pollution
Pre-Swim Hygiene
Showers
Footbath
Toilet
Babies
Faecal Fouling
Diarrhoeal Fouling
Biological Monitoring
Occupational Health of Hydrotherapists.

3 THE POOL PLANT ROOM AND POOL PLANT

3.1 The Pool Plant Room

Security
Ventilation
Gas Boilers
Gas Leaks
Servicing and Maintenance of Electric Heaters
Cold Weather Protection
Electricity supply, Electric Switchgear, Electric Motors and Electric Pumps
Portable Electrical Equipment

3.2 The Pool Filters

The Filter Medium
Checking the Filter Medium
Changing the Filter Medium
Backwashing the Filter
When to Backwash

3.3 The Circulation Pump and Strainer Basket

The Circulation pump
The Strainer Basket
Disinfection with UltraViolet Light

3.4 Plant Room Pipework

Circulation Pipework
Dosing Tubes

3.5 Valves

Multiport valves
Single Valves

3.6 Chemical Dosing Machines and Probes

BiolabUK/Bayrol
Topline
Amperometric and Redox Probes

3.7 Equipment for Dosing Pool Chemicals

Day Tanks and Bunds
Refilling Day Tanks Safely
Cleaning out Bunds
Labelling of Day Tanks and Bunds
Separation of Day Tanks
Dosing Pumps
Dosing Tubes

3.8 Erosion Feeders

Trichlorinators

Recharging the Trichlorinator
Discharging the Trichlorinator
Maintenance of the Trichlorinator

Brominators

Recharging the Brominator
Discharging the Brominator
Maintenance of the Brominator

3.9 Swimming Pool Chemicals

Purchase and Delivery of Chemicals
Labelling of Containers of Pool Chemicals
Technical Data Sheets (TDS)
Safety Data Sheets (SDS)
COSHH Assessments

3.10 Chemical Storage

Security
Signage on the Door of the Chemical Store
Separation of Chemicals

3.11 Safety Equipment

- Fire and Fire Evacuation
- First Aid
- Eyewash Station

3.12 Spillage of Chemicals

- Spill Kit
- Spillage Procedure
- Disposal of Spillages

3.13 Personal Protective Equipment

- Equipment Type**

3.14 Pool Water Chemicals/Parameters/Pool Water testing

- Pools using Chlorine Disinfection
- Pools using Bromine Disinfection
- Langelier balanced Water Test

3.15 Pool Water Test Equipment

- Types of Pool Water Test Equipment
- Photometers
- Comparators
- (Backwash Records)
- Contamination records
- Pool Water Temperatures

3.16 Record Keeping

- Backwash records
- Contamination records
- Pool Water Temperatures

1.0 MANAGEMENT OF SCHOOL SWIMMING POOLS

1.1 INTRODUCTION

This technical guidance is provided to help schools to manage their swimming pools safely. All County Council schools (Community and Voluntary Controlled Schools) should comply with the Technical Guidance. Foundation, Voluntary Aided Schools and Academies are advised to follow the policy and guidance which is based on National Standards.

1.2 RESPONSIBILITIES FOR HEALTH AND SAFETY

The Headteacher

The Headteacher is responsible for ensuring the safe management of the swimming pool and pool plant and for monitoring that the swimming pool is being run in accordance with the County Council requirements and that safe working practices are complied with.

Headteachers should:

- Attend a Swimming Pool Awareness for Headteachers Course and update it every three years;
- Ensure that the staff managing the pool have attended either the Institute for the Management of Sport and Physical Activity (IMSPA) formerly known as the Institute of Sport and Recreational Management (ISRM) National Pool Plant Operators Certificate or Pool Carers Certificate as appropriate;
- Ensure that sufficient staff (at least two) have been trained to run the pool so there is not undue reliance on one person and to reduce the risk of the pool having to be taken out of use because there are insufficient qualified staff to run it;
- Ensure that a risk assessment, Normal Operating Procedure (NOP) and Emergency Action Plan (EAP) have been completed for the pool and that it has been reviewed annually, by the end of March each year, and has been signed and dated to that effect by the Headteacher and Chairman of Governing Body;
- Ensure that a Hire Agreement has been completed with each of the hirers of the pool and signed and dated by the hirer and a representative of the school;

- Ensure that all hirers have been supplied with a copy of the Swimming Pool Risk Assessment, Normal Operating Procedure (NOP) and Emergency Action Plan (EAP) and have adapted the NOP and EAP to their own circumstances as necessary;
- Ensure that the swimming pool is regularly formally inspected by a competent specialist contractor and ensure that the programme of Planned Preventative Maintenance of the Swimming Pool is completed annually by a competent contractor and that records of all maintenance undertaken and any modification to the pool plant are kept readily available on site;
- Ensure that an annual electrical test is carried out on the electrical supply to the pool and on electrically powered pool plant be a competent NICEIC registered electrician and that a record of the date of this test is kept;
- Ensuring that all swimming pool documentation, including maintenance records, is readily accessible to persons running the pool and also to visiting auditors, contractors, health and safety advisors etc.;
- Ensuring that there are fast and effective means of summoning the emergency services if an emergency occurs.
- Ensure that a generic risk assessment for Cryptosporidium (Appendix D) is completed so that it reflects the current control measures for the pool and any further action needed to be taken. Refer to Appendix H for further information on Cryptosporidium.
- Ensure that the Technical guidance on faecal fouling from PWTAG is followed <http://pwtag.org/technicalnotes/1229/>
- Ensure all hirers and pool plant operatives understand the procedures if faecal contamination occurs.
- Ensure each instance of faecal contamination is recorded.
- Ensure the number of bathers is recorded and the records available when the pool is inspected.
- Ensure all bathers are made aware of the restrictions to swimming by improving signage if necessary and adding information to hiring agreements and newsletters to parents.

Recommended signage

If you currently have or have had diarrhoea in the last 48 hours or have been diagnosed with or think you have had Cryptosporidiosis within the last two weeks you are not permitted to enter the pool.

The Pool Plant Operator/Pool Carer

The Pool Plant Operator/Pool Carer is responsible for:

- Attending the appropriate swimming pool operators training courses and other relevant courses as described in this document and managing the pool in accordance with the training given.
- Ensuring that the pool and pool plant is kept secure when it is not in use;
- Monitoring and refilling the pool dosing equipment as necessary following an assessment of the risks and wearing any personal protective equipment and clothing deemed necessary as a result of the assessment;
- Ensuring that the pool water testing regime is carried out in accordance with the requirements of the normal operating procedures;
- Taking the pool out of use whenever he/she has reason to believe it is not safe to use it;
- Ensuring that the swimming pool risk assessment, normal operating procedure and emergency action plan and where appropriate hire agreements are implemented and the copies of them are familiar to pool users;
- Ensuring that the annual programme of planned preventative maintenance is carried out on the pool and plant and that records of this are kept;
- Liaising with the contractors carrying out the pool and plant maintenance and ensuring that they provide the necessary records and documentary evidence of work carried out and the date it was completed;
- Ensuring that the pool and pool plant operating instructions are readily available at point of use and are protected from water damage and are kept tidy and readily accessible when required;
- Ensuring that the daily chemical test procedure is carried out as described in the pool's normal operating procedure and that records of this are made and kept readily available for inspection by the swimming pool auditor. The records should be retained on file for three years;
- Ensuring that the procedures for faecal fouling are followed and recorded;
- Ensure the risk assessment for Cryptosporidium is amended and reviewed regularly;

- Ensuring that materials safety data sheets and COSHH assessment are available at point of use and their instructions are followed;
- Ensuring that personal protective equipment and respiratory protective equipment is correctly worn when required by the risk assessment;
- Ensuring that personal protective equipment is regularly inspected and maintained and appropriately stored and replaced when necessary;
- Ensuring that the pool filters are regularly backwashed in accordance with the training given and that the records of backwashing of the filters are kept on file for three years;
- Ensuring that the means of summoning help in an emergency is operational and that they know how to operate it and how to put into effect the emergency action plan.

Training for Pool Plant Operators and Pool Carers

The Pool Plant Operator(s)/Pool Carer is responsible for the day to day running of the school pool and pool plant in accordance with the training given in the certificated training courses described below:

- Pool Plant Operators running indoor pools that are open all year should complete the three day ISRM National Pool Plant Operators Certificate and a one day refresher course every three years.
- Pool Carers running a seasonal learner pool which is open less than six months of the year should complete the two day pool carer's certificate and a one day refresher course every three years.
- All persons running swimming pools should also have received relevant COSHH and Personal Protective Equipment (PPE) training such as that run by the County Council.

17.1 Annual Visit by the Swimming Pool Auditor

The swimming pool auditor will visit each pool once annually when it is operating and check that the necessary management systems, pool documentation, risk assessments and pool record keeping are in place. He will produce a report following his visit detailing any further action required. A copy will be sent to the Headteacher or the Manager of the Centre a second copy will be sent to the Health and Safety Team. A Health and Safety Adviser will visit and follow up any serious shortcomings. These actions should be implemented as soon as possible after receiving the report. If there are any problems implementing the report the Health and Safety Team should be notified.

Schools which are open all year may wish to request a termly visit from the auditor to check that high standards of operation are maintained throughout the year.

Schools which open their pools from April to October may wish to request two visits from the auditor during the year.

PLEASE NOTE: IT IS VERY IMPORTANT THAT UNDER NO CIRCUMSTANCES SHOULD AN UNTRAINED PERSON RUN A SCHOOL SWIMMING POOL.

Upgrading Swimming Pools and Swimming Pool Plant

Some school pools were installed a considerable time ago when safety and hygiene requirements were less stringent. School pools are usually much more heavily used than domestic pools and for that reason the standard of the pool, plant and equipment needs to be higher and more robust than that of a domestic pool to enable it to cope adequately with the heavier bather loads.

If the pool plant is not adequate this can markedly restrict the use of the pool. All school pools should therefore aim for standards of plant as close as possible to those required in a commercial pool. To do this effectively it is important to appoint a competent contractor who has experience of building commercial rather than domestic pools and who knows how to carry out the work safely.

It is especially important that if an outdoor pool is converted to a covered or indoor pool, enabling it to be used for a substantially greater part of the year, or all year round, that the pool plant is upgraded at the same time to cope with the greatly increased bather load. If this is not done the use of the pool can be severely limited because it cannot handle the additional bather load.

2.0 THE SWIMMING POOL

2.1 THE SWIMMING POOL HALL

2.1.1 Lighting Requirements

General Lighting

The lighting in the pool hall must be suitable and sufficient and must be resistant to the damp and potentially corrosive atmosphere of a pool hall. For further information see the Workplace (Health, Safety and Welfare) Regulations 1992 and also the HSE Publication "Lighting at Work".

To ensure that a good standard of lighting is maintained, artificial lighting must be maintained in good working order and the lighting units need to be kept clean. Illumination levels should be checked annually to ensure that there is no deterioration in lighting levels. The view of the bottom of the pool must not be impaired by poor lighting.

Emergency Lighting

Automatic emergency lighting, powered by an independent source should be provided in areas where sudden light loss, for example, during a power failure, could create a risk, for example indoor pools. This should enable safe evacuation if the main lighting fails in an emergency.

Emergency lighting should be regularly tested and maintained in accordance with the County Council's procedures which can be found in the Buckinghamshire Health and Safety Policies and Procedures: Section 3.3: Fire Safety.

Specialised Lighting Equipment in Hydrotherapy Pools

Some hydrotherapy pools have specialised lighting equipment similar to stage lighting sited over the pool. As they are being used in a damp and corrosive atmosphere regular inspection by a competent electrician is very important.

They should be electrically checked annually by a NICEIC Registered Electrical Engineer approved by the County Council. For further information on electrical safety see Buckinghamshire Health and Safety Policies and Procedures Section 10.3: Electricity at Work

2.1.2 Fire Safety

Fire Risk Assessment

The swimming pool area, particularly the associated swimming pool plant room and pool chemical storage facility should be included in the school's fire risk assessment. For further information on fire safety issues see Buckinghamshire Health and Safety Policies and Procedures Section 3.3 Fire Safety in County Council Establishments.

Fire Exit Signs

Fire and emergency exits should be clearly signed with signs complying with the Safety Signs and Signals Regulations.

If the pool hall is used when it is dark then illuminated emergency exit signs should be provided. These will also need regular testing and records of tests should be kept.

Fire Alarm Call Points

These should be clearly signed and be regularly tested as part of the school's weekly fire alarm testing procedure and a record of this should be kept in the school's fire log.

Heat and Smoke Detection

If heat or smoke detection is provided in indoor pools and plant rooms it must be regularly tested and maintained and records of the tests should be kept in the school's fire log.

2.1.3 Environmental Conditions

Ventilation

Adequate ventilation should be maintained at all times in indoor pools throughout the pool area in-order to clear gases which are by-products of the pool disinfection system and also provide a comfortable environment for swimmers. This can be achieved by opening windows or, if needed, by the use of mechanical ventilation or air conditioning systems. If the failure of the ventilation or air conditioning system could cause a risk to health and safety then an audible or visual warning of the failure of the ventilation system should be provided.

Care needs to be taken if any air recirculation system is used that contaminants are not re-circulated thereby increasing overall contamination levels in the pool hall.

If forced ventilation or air conditioning or air management systems are fitted they must be maintained in accordance with the manufacturer's instructions by a competent engineer. Records of inspection and maintenance should be kept on file.

In hot weather good ventilation is especially important to maintain the pool area at a comfortable temperature.

Temperature and Humidity

A thermometer (preferably maximum and minimum) and humidity meter should be located in the pool hall so that temperature and humidity can be regularly monitored.

2.2 THE SWIMMING POOL SURROUNDINGS

2.2.1 The Pool Structure

Walls

Wall finishes to pool circulation areas should be smooth up to a height of 2 metres minimum so as not to present a hazard to bathers as they circulate around the pool and to facilitate cleaning.

Any projecting piers or columns should be provided with a rounded or bullnose edge.

Glazing

Glazing including windows in transparent or translucent surfaces in walls, partitions, light fittings, should be made of safety material or be protected against breakages.

Any glazing used in the pool area must be to the appropriate specification so that it can withstand body impact (BS 6262: Part 4 1994) if the pool is used for water polo windows will need protection against ball impact by using impact-resistant toughened glass or polycarbonate sheeting or netting.

Ceilings

The design and construction of ceilings and the roof deck over wet areas should take into account the need to avoid condensation which may affect the structural integrity of the roof itself. Suspended ceilings should be avoided whenever possible but if they are essential they should be designed in such a way that allows routine inspection of the ceiling void, internal roof structure and light fittings.

Floors and Finishes

Slip and trip hazards can be minimised by good design. Factors such as surface roughness, moisture displacement, the profile and surface pattern of the finish and foot grip all affect slip resistance.

The slip resistance of any given surface will diminish if the gradient becomes steeper than 1 in 30 or less than 1 in 60 because such a shallow gradient is not sufficient to ensure that the water drains away.

Where falls outside the recommended range have to be specified finishes should have a particularly high slip resistance. Floor finishes with different slip resistances should not normally be specified in the same area as a change in surface can increase the risk of slipping or tripping.

The normal recommended range for the fall in wet areas is between 1 in 35 and 1 in 60, when combined with a slip resistant finish such as 25 stud ceramic tile should create a satisfactory surface

Floors should be cleaned at least once daily when the pool is in use.

Drainage Gullies

Floor gullies, gutters and valleys should not create a tripping hazard and the drainage outlet should have no sharp edges. They should also be easy to maintain and clean and should be cleaned and maintained regularly so that they function efficiently.

Steps

Steps should be in sound condition, clearly visible and should be kept clean. Nosings of steps should be in sound condition and clearly visible. Any flights of steps should be provided with a handrail(s) in accordance with the requirements of the Workplace (Health, Safety and Welfare) Regulations.

Heaters/Radiators/Guarding

All heaters which are situated in locations where bathers may come into contact with them must be adequately guarded to prevent burns.

The Pool Surround (Outdoor Seasonal Pools)

Pool surrounds for external pools often consist of paving slabs. It is important that these are kept in good condition and free of trip hazards which may injure feet. Cracked or broken slabs should be replaced. Any weeds growing in cracks or around the edges of the slabs should be removed. Slabs should be

adequately pointed to reduce weed growth in the cracks. Any steps should be highlighted and provided with a handrail. The area should be swept and cleaned regularly. The fence and gate should be maintained in a sound condition free of rot, holes, protrusion and splinters.

2.2.2 Emergency Equipment and other Equipment

Pool Emergency Alarm

A pool alarm linked to an occupied area such as the school office and staff room where there is a manned landline telephone available should be available in the pool hall or pool compound for use in emergency if there is no land line telephone there. This will usually take the form of a red push button on a yellow ochre background. A button for activating the alarm should be provided on each side of the pool and should be clearly signed to indicate it is the pool alarm for use in an emergency.

It should be checked daily before the pool is used and a record of the checks kept. It will also need to be checked and serviced annually by a competent engineer.

The alarm must sound at a staffed location and staff at that location must know what to do when the alarm sounds. More than one sounder may be required for example in schools office, staff room, Headteacher's office etc.

A set of instructions should be prominently located by the alarm sounder indicating the action required.

A fully charged mobile phone with a strong signal and/or two way radios should be kept available as backup.

Swimming Pool First Aid Kits

A large first aid box containing sufficient first aid equipment for the maximum number of people who are likely to use the pool at one time must be provided in the pool hall. This will usually be a first aid box for 25 or 50 people.

It should be located in a prominent position and its location should be clearly signed so that it is readily obtainable in an emergency.

The contents of the first aid box should be regularly checked and equipment will need to be replaced when it is out of date. This could be carried out as part of the school's regular check of first aid boxes. For further information see Buckinghamshire Health and Safety Policies and Procedures section 8.5 First Aid at Work.

Storage of Pool Equipment

Any equipment stored on the poolside can be potentially hazardous. There should be adequate storage accommodation provided for equipment so it is kept together and does not obstruct the pool surround creating a tripping hazard for bathers and staff. Large plastic boxes with lids are suitable for storing these items. Equipment and storage boxes should be kept clean.

2.2.3 Pool Signage

Signage on Outside of Pool Compound Fence (Outdoor Pools)

A “No Unauthorised Access” sign should be displayed on the gate of the pool compound and “Danger Deep Water” signs should be displayed at prominent points on the perimeter fence and gate.

Signage within the Pool Hall or the Pool Compound

The following signage complying with the Safety Signs and Signals Regulations should be displayed in the pool compound on both sides of the pool. All signs should be large enough to be clearly visible from all areas of the pool compound.

- No running;
- No diving;
- No bombing.

Depth Signs

If the pool is of uniform depth then the depth sign(s) should indicate that depth. There should be a depth sign located on each side of the pool. The signs must be large enough to be clearly visible from all areas of the pool.

If the depth varies then the deep and shallow end and their respective depths should be clearly signed on each side of the pool. Signs must be large enough to be clearly visible from all areas of the pool compound. Depth signs should also be located at regular intervals along the length of the pool indicating the depth at that point.

Pool Profiles

In larger (25 metre) pools where there is a sudden change in depth a pool profile should be displayed on the wall. It should be large enough to be visible from all parts of the pool. The points where the depth changes suddenly should also be indicated at the side of the pool. Depth signs should be placed at regular intervals along the pool side indicating the depth at those points.

Maximum Bather Load

Signs indicating the maximum bather load of the pool should be displayed where they are clearly visible on each side of the pool.

2.2.4 Security Issues

Pool Security

The pool area must be kept secure to prevent unauthorised access and unauthorised use of the pool. Keys should only be issued to authorised persons with a spare kept in the school's key safe in case of emergency. A list of authorised key holders should be maintained.

Security, Fencing and Gates (Outdoor Seasonal Pools)

All outdoor pools must be provided with a perimeter fence and lockable gate. Fencing and gates to outdoor pools should be in sound condition and without holes, sharp edges or splinters. Fencing and gates should be at least 1.8 metres high. The gate should be fastened with a substantial padlock and a list of key holders should be kept.

If security is a particular problem, consideration might be given to providing a higher metal paling fence again with a lockable gate. Pool alarms and CCTV can also provide an additional deterrent to trespassers and vandals.

2.2.5 Showers

Disinfection of Shower Heads

As shower heads may present a risk of Legionella they must be cleaned in accordance with the HSE Code of Practice L8 "Legionnaires' disease: The control of Legionella bacteria in water systems" and the Buckinghamshire County Council Health and Safety Policies and Procedures: Section 4.4 Legionella Policy and Procedures. They will require descaling and disinfecting every three months with the appropriate substances. Records of descaling and disinfection should be kept in the schools Legionella Log.

2.2.6 Pool Covers

Pool Thermal Insulation Covers

Most outdoor pools are fitted with covers which are usually housed on a roller at one end of the pool. Their primary function is to retain heat and limit evaporation.

There are several types of cover used on outdoor pools:

- Bubble covers which also warm the pool;
- Thermal covers which just insulate;
- Slatted covers which may also warm the pool and are stored in a pit;
- One piece sealed covers which run on tracks and are designed to keep children and debris out of the pool.

The danger of unauthorised access and drowning must be considered. Flexible pool covers increase the risk because they may trap an intruder under water. It is therefore important the pool compound is securely fenced and gated and that if trespassing is a problem provision of a pool intruder alarm and CCTV should be considered.

The underside of pool covers must be checked regularly for microbiological contamination and both sides should be checked for algal growth. The cover should be thoroughly cleaned when necessary in accordance with the manufacturer's recommendations.

Flexible plastic covers can support microbial growth and become covered in biofilm in turn can support the growth of bacteria which cause skin and respiratory infections. One of the bacterial colonisers is pseudomonas aeruginosa which is an indicator of pool water quality and a potential pathogen that causes a variety of ear and eye infections. Repeated failures of routine pool water tests can be caused by continual re-infection of the pool by the biofilm on the cover.

Covers that are in good condition and that are regularly cleaned are not generally a problem. Old covers that have started to deteriorate and those that have not been well maintained are more prone to colonisation by bacteria. Non-metallic materials that come into contact with potable water have to comply with BS 6920 which includes a test for their ability to support microbial growth. Materials used for the construction of systems that may present a risk of causing legionnaires disease should also comply with BS 6920.

Selection of Pool Covers

When selecting a pool cover make sure that both ends are reinforced so that one end can be effectively secured to the roller and the other is protected when being pulled over the water surface.

The provision of eyelets approximately every 600 mm in the leading edge of the cover makes it easier to fit pulling cords or ropes to aid pulling the cover across the water.

After any shock dosing using a sanitising agent, leave the cover off the surface of the pool for approximately 2-3 hours to allow the relatively high concentration of the sanitising agent to fall off.

It is important that the solar cover is not left on the pool in the winter months underneath the winter cover. At the end of each swimming season wash the pool cover down with fresh mains water and leave to dry thoroughly. Pack away the solar cover in a cool dry area preferably in a robust container that is rodent proof.

Where there are pool ladders which cannot be moved out of the way when the solar covers are deployed, arrange for cut outs to accommodate the ladders to be provided when the cover is manufactured.

2.2.7 Exceptional Weather Conditions

Heat Waves and Exceptionally High Temperatures

In hot weather covered swimming pools may become exceptionally hot with temperatures reaching as high as 40°C. Ultraviolet light can penetrate the pool cover and care needs to be taken to protect pool users against heat stroke and sunburn. Similarly with outdoor pools care needs to be taken to avoid excessive exposure of the sun. The provision of sunshades, wearing of appropriate clothing to provide protection from the sun is important. Arranging lessons in the cooler parts of the day should also be considered in exceptionally hot weather.

In covered pools a thermometer (preferably a maximum and minimum thermometer) should be kept in the pool area so that the temperature can be monitored.

It is important to provide shaded areas in the pool area to protect people from excess sun. Picnic umbrellas can be useful for providing extra shading.

Further information about protection from excessive sunlight can be found in the Buckinghamshire Health and Safety Policies and Procedures Section 8.7. Working Outdoors in the Sun.

Adverse Weather Procedures (Outdoor Pools and Covered Pools with no Artificial Lighting)

Weather conditions can change very rapidly even in the summer months. A check of the local weather forecast should be made daily prior to the use of

the pool. Particular care needs to be taken if thunderstorms are likely as these can produce conditions that could make it difficult to see the bottom of the pool. Children may find thunder very frightening so care needs to be taken to avoid panic. Particular care needs to be taken when evacuating the pool in an emergency that everyone is accounted for and that the pool is visually checked to ensure that everyone is out of it. A role call should be taken to check this.

A written procedure clearly stating when the pool should be evacuated in poor light or adverse weather should be clearly displayed in the pool compound. This should be framed or laminated to protect it from water damage.

2.2 THE SWIMMING POOL

2.2.1 THE SWIMMING POOL TANK

Pool Tank Depth

There are a number of important safety features listed below which apply to pool tanks:

- Abrupt changes in depth should be avoided in water less than 1.5 metres in depth;
- Steep gradients should be avoided. A maximum gradient of 1 in 15 is recommended for water depths up to 1.5 metres;
- Changes in depth should be clearly identified by the use of colour contrasting materials or patterned finishes so as to indicate to bathers when they are moving into water of a different depth. Where colour is used it must not obscure the visibility of a body lying on the pool bottom;
- A minimum depth of water of 1 metre is recommended for larger pools used for training or competition; for small seasonal pools a minimum depth of 900mm is recommended.

Pool Tank Edges

The pool tank edge should be colour contrasted with the pool so it is clearly visible to bathers in the water and bathers on the pool surround. This is especially important for deck level pools where the pool edge may be partially submerged.

Pool Tank Details

It is recommended that the pool tank should:

- Have no sharp edges or projections that could cause injury to bathers. This is particularly important below the waterline. The location and design of recesses, ledges or rails should be carefully considered so they are not a hazard;
- Sumps, inlets and outlets of the pool water circulation system must have suitable protective covers or grilles. These must be designed to prevent limbs and fingers getting trapped.
- There must not be excessive suction from pool outlets which could result in vacuum trapping, persons being held against a grille by the force of the water flowing through it or by hair entanglement, a person's hair being trapped in the grille caused by the vortex produced as water flows through it.
- Where there is only one outlet a vacuum and hair entrapment test must have been carried out and documentary evidence of this should be retained by the school in the swimming pool file;
- Usually there should be at least two outlets on each suction line at a sufficient distance apart to prevent a body being drawn or trapped by two suction line outlets. The amount of suction produced at any single outlet position should not be sufficient to result in the body being drawn towards it or to entangle hair. Anti-vortex grilles should be fitted to all pool outlets;
- Where there is a single outlet only on one suction line, anti vortex grilles must be fitted and the water velocity should be less than 0.5 m/s. An entanglement test must be carried out on the grille by a competent person. This can be arranged through the Institute for the Management of Sport and Physical Activity, IMSPA (formerly ISRM);
- When funds allow the pool circulation system should be upgraded so that there are at least two outlets on each suction line. This can also provide an opportunity to upgrade pool filtration and pool circulation times.

Pool Tank Bottom

A slip resistant and non-abrasive finish should be provided on the end walls of the pool as a turning pad to aid tumble turns.

If racing lines are not included then a line running along the centre of the pool will assist bathers to determine sudden changes in depth.

The ability to see the bottom of the pool clearly is essential for lifeguards.

Pool floor patterns which make it difficult to see a body at the bottom of the pool should not be used.

2.2.2 ACCESSING AND EXITING THE POOL

Access to the Pool Tank

Access to swimming pools is usually provided by built in steps or ladders. This may be determined by the type of pool. These must provide; easy and safe entry to, and exit from, the pool.

Entry steps and ladders should not interfere with the use of the pool and should be positioned so as not to disrupt or endanger the swimmers.

Access to and exit from pools will usually be provided by a ladder at each end of the pool's tank or in some cases for learner pools a set of steps at the side of the pool.

Pool Steps and Ladders

Handrails, steps and ladders providing access to the pool:

- Must be of sufficient strength and firmly fixed to the surround and tank walls
- Should be provided to ensure that finger, limb and head traps are not created, either between the treads or the tank walls, or between the grab rails and tank walls;
- Steps should be provided with the likely user in mind:
 - Steps providing access to learner pools or shallow water should have a shallow riser between 150mm and 160mm and be wide enough, more than 300mm minimum to allow easy use by children or an adult carrying a child.
 - The leading edge of each step should be colour contrasted for increased visibility from both in and out of the water;
 - Steps should have treads which are slip resistant and have no sharp edges;

- Steps should be designed giving consideration to the ease of access to and exit from the pool by users with restricted mobility or those with disabilities.

Moveable Floors

Where pools have moveable floors/bulkheads this will affect the pool tank profile and will create a wider range of different profiles. Care needs to be taken to ensure that no additional hazards are created.

The control panel used to operate the floor should be located so that the operator has a clear view of the floor.

Water depth indicators should be mounted on the wall in a prominent position so they can be easily seen by bathers both from the pool and from the surround. The indicators should be clear and accurate.

Some moveable floors and bulkheads can be brought to the surface and tilted carefully so that both surfaces can be cleaned. This may be necessary twice a year. An observation window is helpful to enable checks to be made.

It is not possible to tilt most moveable floors for cleaning. They are provided with access hatches or manholes for inspection. Cleaning and maintenance of moveable floors is the work of specialist diving contractors who should work in accordance with the Diving at Work Regulations.

In any case debris will settle out under the floor and should be removed twice a year with a pool vacuum cleaner.

Pool Hoists

Appropriate equipment must be provided to enable persons with mobility problems to access and exit the pool, either with or without assistance. The provision of mobile and/or fixed electrically powered mechanical hoists can minimise the amount of handling which is required to enable a person with mobility problems to access the pool.

All hoists and slings should comply with current British and European Standards. They should be installed by a competent contractor. They should be visually inspected each day the pool is used and must be given a thorough examination and test by a competent engineer, usually an engineering surveyor approved by the school's employer's insurers, once every six months in accordance with the Lifting Operations and Lifting Equipment Regulations. A record of the daily visual inspection and the examination and test should be kept on file for the life of the hoist.

All slings used must be compatible with the hoist being used. If there is any doubt then the hoist supplier/manufacturer should be consulted. The location of hoists needs to be carefully considered to maximise their benefit and use and to avoid them obstructing the free movement of bathers and staff.

Persons who operate hoists and slings must have received training in their correct and safe use and in making manual handling risk assessments. Specific risk assessments for individual students with special needs will need to be produced especially where the pupil has severe disabilities. For further information please see Buckinghamshire Health and Safety Policies and Procedures Section 5.2 Pupil Moving and Handling or contact the Buckinghamshire County Council Health and Safety Team for assistance through the HR Service Desk 01296 382233.

Design of Ramps

Any ramps providing access to the pool:

- Should have a gradient which does not exceed 1 in 15;
- Should have a clear width of 1 metre;
- Should have a slip resistant surface;
- Should have handrails on both sides of the ramp;
- Should have sufficient space at the bottom and top of the ramp for manoeuvring a wheelchair;
- Should not protrude into competitive areas;
- Should be regularly cleaned to reduce the risk of slipping.

2.2.3 SWIMMING POOL INLETS AND OUTLETS

Swimming Pool Inlet and Outlet Safety

Outlets are the points where water leaves the pool to go to the filtration plant.

The potential dangers of swimming pool outlets and inlets are well documented. There is a history of serious accidents involving entrapment of hair or a part of the body in a swimming pool outlet resulting in significant internal injuries or drowning.

This danger is particularly significant in the following situations:

- Pools with a single outlet in the pool bottom that is connected directly to the pump, which can be readily accessed by a bather and is small in size so that a bather can block it with their body. This type of installation is frequently seen in older pools or in pools which have been poorly specified or incorrectly designed;
- Pools where water velocities in the vicinity of the outlet are in excess of those recommended and have the potential to draw a person onto it or draw hair through it where it entangles and prevents it being withdrawn;
- Pools with two or more outlets where corrosion or scale formation in an outlet line has caused an increase in the velocity of another. This can be avoided if good practice regarding water balance and chemical dosing is followed;
- Pools where the outlet cover is not properly secured;
- Pools where the outlet cover has insufficient strength to withstand the load of say a bather jumping into the pool onto the cover causing it to collapse and trap the bather. This can happen to some outlet covers that over time become brittle due to the action of Ultraviolet light and/or pool chemicals.

Pool Inlets

Inlets are points where water is fed back into the pool from the filtration plant.

- Inlets must be strong enough to withstand any likely impact;
- Inlets must be securely fixed in position;
- Apertures in inlets should not exceed a gap of 8 millimetres to avoid entrapment;
- Inlets should not protrude into the pool or have sharp edges or corners that could cause injury;
- Inlets should be arranged so that each one takes its required proportion of water flow;
- There should be sufficient inlets to ensure that the velocity of the water entering the pool does not exceed 1.5 to 2.0 m/sec or if possible as low as 0.5 m/sec in shallow water or sensitive areas such as steps or teaching areas where turbulence may be a problem.

Size of Aperture of Outlet Grilles

Outlet grilles are grilles on the pipes which take water from the pool to the plant room for filtration and disinfection. To prevent entrapment of fingers and toes, apertures in outlet grilles should not allow an 8mm diameter probe to pass through them.

Prevention of Vacuum Entrapment

There are a number of ways in which the risk of a vacuum forming on a suction line when an outlet becomes blocked can be reduced. They are:

Having more than one Pool Outlet

At least two and preferably more outlets should be fitted to a suction line. The outlets should be fitted 2 -3 metres apart or as far from one another as possible to prevent a bathers body being able to cover both outlets at the same time. This should ensure that should part or all of one outlet become covered then the second or other outlets are able to take the full flow, thus preventing a vacuum forming and the risk of entrapment over the pool outlet.

Size of Outlets

The size of the grille or cover should be such that it is difficult, if not impossible, for a bather to cover it completely with their body.

Outlet Design and Installation

Outlets Fitted to Sumps

Outlet covers should cover a sump fitted to the outlet pipe rather than simply covering the end of the outlet pipe. The area of the cover should be between 6 to 10 times greater than the area of the pipe although a suction velocity of the water should not exceed 0.5 m/sec must be the determining factor.

The advantage of sump outlets is that the surface area of the grille increases the size of the free area and reduces the velocity through the grille.

It becomes more difficult for a bather to cover the entire grille. The sump allows the pumped water to flow more slowly and evenly through the grille, helping to prevent the creation of dangerous currents and hair entangling vortexes.

In an existing pool with a single outlet it may be possible:

- to fit two or more outlets to the suction line sufficiently large or spaced so that a bather cannot block them;
- fit a large sump with a cover on the line of sufficient size to ensure a bather cannot block it with their body;
- Fit an anti vortex cover sized and designed to ensure a bather cannot block it with their body;
- Make sure the pump cannot draw only from the bottom outlet.

Securely Fixed Outlet Covers

The outlet cover should be designed and installed so as to be secure.

- There must be a sufficient number of fixings to ensure that the cover remains in the frame, for example, if one fixing becomes removed or dislodged, the cover should not pivot on a single fixing.
- The fixing devices should be tamper proof and provide adequate security against deliberate or unintentional actions.

Anti-Vortex Covers

Anti-vortex covers are large domed covers fitted to outlets in the pool where water flow is mainly round the perimeter of the gap between the cover and then pool floor.

The gap between the cover and the pool floor must be less than 8 mm. The preceding requirements of size, security of the cover and velocity of flow still apply.

This type of pool cover will protrude to some extent above the pool base and may pose a hazard in shallow water areas.

Supervision of Pool Users

Outlets and inlets all pose potential risks and whilst a number of measures can be put in place to reduce the risk, there is no substitute for the presence of trained and competent staff at all times. Outlets can have a dangerous fascination for children.

An awareness of the risks involved should form part of staff training and be contained in the pool's Normal Operating Procedures (NOPs). Action to be

taken in the event of an emergency associated with the pool outlet should be covered under the pool's Emergency Action Plan (EAP).

All supervisory staff should have received appropriate training and be aware of the action to be taken in an emergency.

Skimmers

Skimmers are devices for removing surface water from the pool. Much of the pool contamination is contained in the top 150 mm (6 inches) of the pool so skimmers have an important role to play in maintaining a good standard of pool water quality.

Skimmers are short self adjusting weirs installed at intervals around the side of the pool. They deal with variations of water level arising from bather displacement. Each skimmer will only remove a small proportion of the surface water and this means that their efficiency as a method for removing surface water depends on how many are installed. In theory, enough skimmers can be fitted to remove the majority of the surface water.

Most pools in Buckinghamshire Schools, especially the seasonal pools, use skimmers to remove the surface water from the pool. Increasing the number of skimmers on a pool can substantially improve the water quality.

2.3.4 KEEPING THE SWIMMING POOL CLEAN

Pool Cleaning

It is essential that the pool is kept clean. A regular cleaning regime reduces the build up of dirt, grime and scale and improves the quality of the swim. It may also reduce the quantity of chemicals needed to disinfect the pool. A cleaning schedule should be produced and records of when the pool is cleaned should be kept.

Pool Cleaning Brushes

Long handled pool cleaning brushes can be used to brush the bottom and the walls of the pool. If used on deepwater pools or deck level pools care needs to be taken by the pool user not to fall into the pool whilst brushing it.

Pool Vacuums

Pool vacuums are expensive but often the most effective way of keeping the pool walls and floor clean. Once set up they can be left to work their own way round the pool thus saving the pool operator a substantial amount of time.

Pool Nets

Pool nets should be available for the removal of any solid material such as stools from the pool. In outdoor pools they are also useful for removing debris which may fall into the pool such as leaves and twigs after stormy weather. After use in a contamination incident the nets should be thoroughly cleaned and disinfected.

Cloudy Pool Procedure (All Pools)

A procedure clearly stating the conditions under which the pool should be evacuated if the water is cloudy and the bottom of the pool is not clearly visible should be prominently displayed in the pool compound. This should be framed or laminated to protect it from water damage.

2.3.5 EMERGENCY EQUIPMENT

Rescue Poles

A rescue pole should be available in a prominent position on each side of the pool. Its location should be clearly signed so it is kept in the same location and it is clear if it is missing. The poles should be long enough to reach half way across the width of the pool but should not be so long that their use is obstructed by the walls of the pool hall or the fence surrounding the pool.

Thermal Blankets for Emergencies

Sufficient emergency blankets should be provided for the maximum number of people who are likely to use the pool at one time with a few spares. These should be kept readily available in the pool hall in a box with a lid which is clearly signed to indicate its contents. Provision of a pair of scissors in the box can facilitate opening the packets containing the blankets in an emergency. Their location should be prominently signed so they can be readily found in an emergency.

2.3.6 HYDROTHERAPY POOLS

Disinfection

There is no satisfactory alternative to chlorine based disinfectant in hydrotherapy pools. Ozone and more usually in new hydrotherapy pools, ultraviolet light, are used in addition to chlorine but they cannot substitute for the main disinfectant.

The use of bromochloro dimethylhydantion (BCDMH) is **not** appropriate for hydrotherapy pools as it can cause rashes (bromine itch) especially after prolonged exposure.

Bromine Itch

This problem is associated with the use of BCDMH, which for some people in some pools produces an intensely itching contact dermatitis (i.e. eczema) especially after re-exposure. The itching usually precedes a visible rash within 12 hours of exposure. The frequency of the rash increases with age, being unusual in children and more common in bathers of more than 50 years of age. It is also more frequent and severe with prolonged exposure, which may occur occupationally for example to hydrotherapists.

The distinction between bromine itch and folliculitis is fairly easy to recognise:

- The chemical irritation of bromine itch invariably appears within 12 hours of exposure; folliculitis usually takes 24 hours to appear;
- Itching which can be severe is the main symptom of bromine rash and is minimal with folliculitis;

Maintaining Good Water Quality

The users of hydrotherapy pools have special vulnerabilities. The water and air quality of a hydrotherapy pool needs the same careful attention as a heavily used large public pool.

The higher water temperature in a hydrotherapy pool encourages the proliferation of microbes and the breakdown of chemicals. A fast turnover time of 30 to 90 minutes is necessary to maintain good hygienic conditions.

It is important in hydrotherapy pools to keep the combined chlorine residual as low as possible. It should ideally be zero and should never be more than 1.0 mg/litre and should never be more than half the level of the free chlorine residual.

With automatic chemical control of the free chlorine and pH and a short turnover time together with the recommended dilution by the addition of 30 litres of water per bather per day of fresh water it should be possible to keep the free chlorine around 1 mg/l and never more than 2 mg/l. pH values should be kept below 7.6 and preferably within the range of 7.2 – 7.4.

In the event of a high combined chlorine residual and an irritant atmosphere in the pool hall attention needs to be paid to minimising contamination from those in the pool particularly from sweat and urine. Users should use the toilet and shower before bathing. A check should be made to ensure that the

chlorine and pH are within the ranges recommended, that there is adequate dilution with fresh water and that the pool hall is adequately ventilated.

Filtration

Medium rate filtration is important for the water treatment of hydrotherapy pools. The efficiency of filters is considerably enhanced by the use of a flocculent particularly in relation to the removal of cryptosporidium to which immunocompromised patients are particularly vulnerable. This organism is most likely to be in the water after a liquid faecal accident in the pool. Whilst most hydrotherapy pools can be emptied in the event of contamination with liquid faeces experience shows that diarrhoea accidents are often either not seen or reported. Optimum pool filtration is important at all times. Encouraging students to use the toilet before hydrotherapy sessions is important to try and prevent this type of contamination.

Balance Tanks (Hydrotherapy Pools)

A balance tank is a reservoir of water between the pool itself and the rest of the circulation system. It helps maintain a constant pool water level and supply to the pumps.

Balance tanks should be visually checked monthly for any build up of debris. A build up of sand for example may be a sign of deterioration of the concrete or a broken filter lateral. Sand can provide a home for bacteria that may spread to other parts of the pool. Calcium deposits in the balance tank may suggest poor chemical balance.

A well designed balance tank should clear most debris continuously. Tanks should be inspected once a year by a competent contractor and be cleaned if necessary. This requires them to be drained and any debris removed. The inner surfaces are brushed and flushed down with 10mg/litre of chlorinated water that can be returned to the circulation system.

Balance tanks should be treated as confined spaces as they have limited access and limited ventilation which allows the build up of hazardous fumes. Entry to confined spaces should be carried out in accordance with the County Council's Policy and Guidance on Confined Spaces. It is the County Council policy that Council employees should not enter confined spaces so this type of work must be undertaken by a competent specialist contractor.

For further information please see Buckinghamshire Health and Safety Policies and Procedures Section 9.6 Working in Confined Spaces.

2.3.7 POLLUTION FROM BATHERS

Different Types of Pollution

Any substance associated with the human body may be introduced into the pool water by bathers.

There are three main types of pollution.

- Tissues – hair, skin
- Excretions – sweat, urine, faecal matter
- Dirt – dust, grass, suntan lotion, cosmetics

Urination, some of which is involuntary, does happen in swimming pools. Research suggests that perhaps 30ml of urine is released on average per bather. That is equivalent to 200mg of urea per day.

Most bathers will lose significant quantities of urea in sweat in the exercise of swimming, especially in water with a high pool temperature that has become common nowadays. An average 950ml of sweat per swimmer per hour has been estimated. That adds another 250mg of urea.

The reaction between the disinfectant and breakdown products of urea in sweat and urine is the main cause of high combined chlorine residuals (chloramines) in the water and these contribute to eye and skin irritation. Some of these chlorine compounds can pass into the air producing irritant gases in the air above the pool. These gases can affect bathers, poolside staff and spectators.

Urea also adds considerably to the costs of maintaining the quality of the pool water. More water and air changes are needed which requires more energy to maintain the comfort of the bathers.

Dirt of all types normally collects on the body before bathing. Cosmetic materials such as; powders, creams, lotions and oils are rich in pollutants, many of which impose a significant burden on the water treatment system.

Pre-Swim Hygiene

Pre-swim showering is an effective way of removing significant amounts of dirt and bacteria that otherwise end in the pool and it is estimated that two-thirds of sweat products and one third of bacteria are removed by showering. Even without soap a shower removes much of the pollution which would otherwise enter the pool. A shower removes five times as much pollution as a footbath.

If pre-swim showering is in place the pool water will be cleaner and easier to disinfect, requiring less chemicals and thus reducing costs.

Showers

It is desirable that a pool should have at least one set of showers to facilitate pre swim showering and swimmers should be encouraged to use them before bathing and adequate time should be allowed for this. All appropriate precautions relating to legionella should be taken in accordance with the County Legionella Policy and Procedures.

Footbaths

The role of footbaths in dealing with verrucas and other foot infections is now considered to be irrelevant. Showers do the cleaning more effectively and provide extra benefits. If there is no alternative, especially in an outdoor pool, a properly maintained foot bath or foot spray is better than nothing.

Toilets

Toilets should be used before entering the showers and the pool. Explanatory notices and posters should be prominently displayed. Everyone should be encouraged to use the toilets before showering to minimise voluntary and involuntary urination within the pool. Children will need extra encouragement to use the toilet. Pool management should include the regular inspection and cleaning of the toilets.

Babies

Babies should not be allowed to swim in ordinary nappies, instead if they are old enough they should be encouraged to empty their bladders before they swim and wear a 'swim nappy' that is waterproof both ways.

Faecal Fouling

There is a significant risk of faecal fouling in swimming pools especially if they are used by babies and very young children. Procedures need to be in place for dealing with faecal fouling incidents and all staff should be aware of them.

Solid faeces should be removed from the pool as rapidly as possible. A net on a long pole should be kept available for this purpose. No other action should be necessary as long as the disinfection levels in the pool are within the range set for the pool and it has been possible to remove all the material.

Diarrhoeal Fouling

Diarrhoeal fouling is likely to contain potentially hazardous bacteria and viruses. If the disinfectant concentration is within the correct range then the bacteria and viruses should be inactivated within minutes by the residual

disinfectant. Diarrhoea may however contain oocysts of *Cryptosporidium*, an intestinal parasite. This can cause chronic diarrhoea and vomiting when ingested and is a serious threat to immunocompromised bathers. *Cryptosporidium* is not killed rapidly enough by chlorine in the pool although it can be by ultraviolet light or ozone. Effective deep bed filtration should remove *Cryptosporidium* oocysts. Further information on *Cryptosporidium* can be found in Appendix D (Generic Risk Assessment) and Appendix H.

When diarrhoeal fouling occurs it should be dealt with by

- Closing the fouled pool and ensure bathers leave the pool and shower immediately;
- Maintaining disinfectant levels at the top of the operating range;
- Vacuuming and sweeping the pool;
- Using a coagulant and filter for six turnover cycles;
- Backwashing of filters;
- Checking the final chlorine residual and pH value of the pool water.

The pool should not re-open until these actions have been completed. The actions above should also be carried out if the pool has been identified as a potential source of *cryptosporidium*.

For further information see Appendix E Emergency Action Plan.

The risks of *cryptosporidium* can be reduced by discouraging babies under the age of six months from using the pool:

- Encouraging all bathers to shower thoroughly before using the pool;
- Providing good hygienic nappy changing areas;
- Discouraging anyone who has been ill with diarrhoea up to 14 days previously from using the pool. A notice should be displayed to this effect.

Microbiological Testing

Regular microbiological testing is essential for the safe operation of swimming pools. If the results are not satisfactory then the pool should be closed until the problem has been remedied.

Records of microbiological test results for the pool should be kept for at least 5 years.

Microbiological testing should be carried out by a UKAS Registered external contractor, for example, from Kingfisher Environmental or STATS Environmental at the following times:

For pools that are open all year microbiological testing should be carried out:

- When the pool opens for the first time and then after any period of closure;
- Once a month thereafter;
- After any incident of contamination.

For seasonal pools microbiological testing should be carried out;

- before the pool opens at the start of the season or after any significant period of closure such as over the summer vacation;
- once a **month** thereafter; and
- after any incident of contamination.

For hydrotherapy pools microbiological testing should be carried out:

- before the pool is used for the first time or after any significant period of closure;
- once a **week** thereafter, on a Monday if possible;
- after any incident of contamination.

If the test is carried out at the start of the week on Monday and the results are not satisfactory then there is time for a retest before the end of the week.

Occupational Health of Hydrotherapists

Since working in the hot humid conditions of a hydrotherapy pool is very demanding, the time limits are usually three hours a day, 2 hours in the morning or two in the afternoon.

Staff with intermittent eczema or particularly dry skin may find hydrotherapy work difficult. An emollient cream (for example Aqueous Cream BP) should be provided together with a ready supply of cool water near to the hydrotherapy pool. Wearing light cotton clothing is recommended.

SECTION 3: THE POOL PLANT ROOM AND POOL PLANT

3.1 THE POOL PLANT ROOM

Security

The swimming pool plant room must be kept secure at all times. Keys should be issued to authorised users only, with a spare kept in the school's key safe in case of emergency. A list of key holders should be maintained. A sign should be displayed on the door indicating that there is no unauthorised access to the plant room.

Ventilation

It is essential that the pool plant room is adequately ventilated to avoid the build up of gases and high temperatures. Ventilation may be provided by the provision of an adequate number of air bricks at both high and low level or by the use of extraction fans. A maximum and minimum thermometer should be located in the plant room to monitor temperatures.

Gas Boilers

Gas fired boilers must only be serviced, maintained, connected or disconnected by Gas Safe Registered Gas Engineers. A record of servicing and maintenance of boilers must be kept on site and be ready for inspection by visiting officers.

Gas Leaks

In the event of a gas leak, isolate the supply, if it is safe to do so, by turning off the main stop valve. Call the emergency gas safe registered engineer immediately by telephoning 0800 111 999 the gas supply should be turned off at the main stop valve and the mains gas valves should only be turned on again by a Gas Safe Registered Engineer when he/she is happy that the system is safe.

Servicing and Maintenance of Electric Heaters

Electric heaters should be serviced and maintained annually by a competent NICEIC registered electrical engineer and records of service and maintenance of electric heaters should be kept on the swimming pool file.

Cold Weather Protection

In plant rooms of pools which are open all year water circulation and dosing pipe work may be vulnerable to freezing and splitting in severe weather.

Lagging and thermostatically controlled heaters may need to be installed to prevent the pipework freezing up.

Electrical Supply, Electrical Switchgear, Electric Motors and Electric Pumps

The risks from electrical equipment are made worse by the wet and corrosive conditions in swimming pools and swimming pool plant rooms.

Work on electrical equipment should only be undertaken by qualified electricians who are NICEIC Registered.

Fixed electrical installations and equipment require specialist knowledge and skills and should be to the standard of the IET (BS 7671) 17th Edition. Wiring Regulations. This sets out the types of electrical system suitable for different locations within the pool area, for example, the type of measures against electric shock, the type of switchgear and accessories that may be suitable.

The responsibility for ensuring that the electrical installation is electrically earthed and bonded where necessary rests with the pool operator. The integrity and effectiveness of the earthing and bonding needs to be inspected and tested annually and records should be kept.

Where possible switches should be fitted to enable parts of the installation to be disconnected from the supply when necessary. These switches should be of a type designated to provide electrical isolation so that maintenance, modification, and repair can be undertaken safely.

Electrical sockets should not normally be located in wet areas. Where they are they should be of a type suitable for a wet environment complying with EN 60309-2:1998. Particular care should be taken when hoses or water jets are used.

The supply to these outlets and those used to supply leads and equipment to be used in wet areas, should be protected either by the use of earth monitoring systems especially for three phase 400 V ac supplies or supplies fed through non-adjustable residual current devices (RCDs) with a rated tripping current not exceeding 30 mA.

Residual Current Devices should be:

- installed in a damp proof enclosure;
- The test reset button should be accessible but exclude the ingress of damp;
- All cable entries should be properly sealed;
- Protected against mechanical damage and vibration;
- Checked daily by operating the test button;

- Inspected weekly together with the equipment it is supplying, during the formal visual inspection;
- Tested every three months by an electrician using the appropriate test equipment.

An electrical test of the complete installation including, the electrical supply, switchgear and any electrical equipment such as heaters and pumps should be tested and certificated annually by a competent NICEIC Registered electrician. A record of the annual test should be kept.

Electric motors should be monitored weekly. A record of weekly monitoring of the motors should be kept.

Motors and pumps should be oiled and greased from time to time where necessary. They should be visually checked regularly for signs of excessive wear, water leakage, overheating, and other defects. Any defects should be reported to the maintenance contractor.

Any damage or deterioration to electrical switchgears wiring etc requires immediate attention from a registered electrical contractor. If there is any risk of persons coming into contact with a live conductor then the supply will need to be isolated until a repair has been made and that the system has been tested to ensure that it is safe.

Portable Electrical Equipment

Portable electrical equipment should not be used in wet areas. When it is necessary to use portable electrical equipment near the poolside, it must be carefully selected and carefully used so as to minimise risk.

A voltage as low as 50 V can be fatal to someone immersed in water so great care must be taken.

Mains voltage audio and similar equipment should not be allowed on or near the pool side unless it is specifically designed for use near water. Pool operators need to make sure that persons hiring the pool and/or contractors working in the poolside area do not bring unsuitable electrical items onto the pool side.

3.2 THE POOL FILTERS

The Filter Medium

Sand is the only filter medium recommended for schools swimming pool filters. Cartridge filters are generally not adequate for school pools. Experience has shown that they are not able to handle the bather load effectively.

Checking the Filter Medium

The lid should be taken off the filter and the condition of the sand should be inspected annually by a competent swimming pool contractor as part of the annual pool maintenance programme.

Changing the Filter Medium

The filter medium will not need to be replaced every year but will need to be replaced from time to time. The contractor will be able to advise when a filter sand change is necessary. Records of when the swimming pool filter medium was last inspected and when it was last changed should be kept in the swimming pool log.

Backwashing of Swimming Pool Filters

In-order for swimming pool filters to function efficiently it is essential that they are regularly backwashed. Backwashing involves passing swimming pool water back through the filters to wash them and then allowing the water to flow to waste. It is an important part of caring for the filters and also for introducing fresh water to the pool to replace the water that has run to waste during the backwash.

A five minute backwash may clean the filter bed adequately, but a viewing window or sight glass on the filter outlet is the only way to check progress effectively.

Backwashing should continue until the backwash water is clear. The manufacturer's instructions relating to backwashing should also be taken into account.

After backwashing the normal flow should be restarted, but the filter water should run to waste for a few minutes to allow the newly expanded filter bed to settle and dirt in the pipe work to drain off.

It is important that the backwash flow is fast enough to fluidise the sand bed so that it expands by 15-25%. It is important that there is enough space in the

filter to do this. The backwash flow must be at least 30m³/m²/h for sand of grain diameter 0.5-1.0mm sand. Coarser grains may require a faster flow.

Backwash flow rates must not be so high that the bed expands beyond the overflow level.

A viewing port window which allows the operator to see the top of the sand bed enables them to see if fluidisation has happened. Manufacturer's recommendations must be followed.

The backwash water pipe work must be of large enough diameter to discharge the water without build up of pressure inside the filter tank. The pumps must be able to cope with the work.

Backwash pipelines should be of the appropriate size and diameter and be routed so that the water can flow freely to the drain without water becoming trapped and stagnant. Pipelines should not be routed upwards or overhead.

Backwash water from commercial pools and spa pools is classified as a trade effluent, so approval has to be sought from the relevant water authorities about the nature, volume and frequency of the discharge from backwashing and dilution.

The backwash drains must be adequate for the volume and velocity of the backwash water. If the drainage system cannot deal with the backwash flow rate, a backwash water holding tank (not a balance tank) may have to be installed. It should be sized to take at least one backwash plus 20%, and should have an alarm or shut off to avoid flooding.

A written safe system of work should be produced for backwashing the filters and should be displayed on the wall of the plant room adjacent to the filters. If there is more than one filter it may be necessary to backwash them one at a time so as not to overload the drains. If there are still problems with excess water being pumped to the drains a holding tank may be required.

A holding tank may also be necessary if the water has to be dechlorinated before release.

When to Backwash

Backwashing should preferably be done either at the end of the day or whenever the loss of pressure across the filter reaches the level recommended by the filter manufacturer. It should be carried out at least once a week and will normally be done twice a week and records should be kept. It should not be done too often on the false premise that the more often backwashing is done the better. Filters take time to return to their most

efficient after backwashing so they should not be backwashed more often than is necessary.

Filters should also be backwashed if the circulation has to be stopped because of a failure or for maintenance (Normally, filtration and pool circulation should continue for 24 hours a day.)

Backwashing should **not** be done whilst the pool is in use as it will reduce the depth of the pool and active disinfection will also stop during backwashing. After backwashing the first few minutes of flow should run to waste.

After backwashing a filter sand bed takes between 30 and 120 minutes to settle and return to full working efficiency. For this reason backwashing at the end of the day is helpful as it allows the filter to return to optimum efficiency whilst there are no bathers in the pool.

A record of the date, time of day and the length of time the filter was backwashed should be kept for each filter.

3.3 THE CIRCULATION PUMPS AND STRAINER BASKETS

Circulation Pumps

There should be a conveniently located labelled switch to enable the circulation pumps to be switched on and off easily.

The pumps should be serviced and maintained annually and records of this should be kept in the Swimming Pool File. Pumps will need replacing from time to time as eventually they wear out.

If the circulation pumps fail the dosing system should automatically be switched off to prevent excessive disinfection.

Strainer Baskets

The strainer baskets should be emptied at least once weekly. The dates when they are emptied should be recorded. There should be a written procedure for changing the strainer baskets displayed on the wall of the plant room and a copy kept in the swimming pool manual.

Disinfection with Ultraviolet Light

Some hydrotherapy pools use ultraviolet light units to disinfect the pool water in addition to the normal chlorination process. The ultra violet equipment should be regularly checked to ensure that it is functioning properly. The lamps will need replacement annually or in accordance with the manufacturer's instructions. This work should be carried out by a competent

engineer who has been trained in the servicing of this equipment. Ultraviolet light can cause serious damage to the eyes and under no circumstances should an employee attempt to change the lamps or do any other work on this type of equipment. Records of the replacement of the bulbs and any other maintenance of the ultraviolet light equipment should be kept.

3.4 PLANT ROOM PIPEWORK

Circulation Pipework

All pool plant circulation pipe work should be clearly labelled with an arrow to indicate the direction of flow and which part of the pool circulation it serves.

Dosing Tubes

All dosing tubes should be labelled with an arrow to indicate the direction of flow and the content of the pipes. Dosing tubes should be protected from damage by running them through larger more robust tubes. Liquids in dosing tubes may be prone to freezing in exceptionally cold weather so additional thermostatically controlled heating may be needed in the plant room to prevent this happening in severe weather conditions.

3.5 VALVES

Multiport Valves

Multiport valves should have a plate affixed to them indicating the function of each position of the valve control lever. It is important that the plate indicating the function of each valve lever position is correctly indicated.

Single Valves

All single valves must be uniquely identified with a number and an indication of their function so that they can be clearly identified in the written safe system of work for backwashing the pool.

3.6 CHEMICAL DOSING MACHINES AND PROBES

The following companies supply this type of equipment suitable for school and commercial pools.

Biolab/Bayrol

This company can supply pool dosing equipment and controllers for both larger 25 metre pools for which the larger "Analyt Controllers" are appropriate and also for smaller covered pools or seasonal pools where the smaller "Compact Controllers" are adequate.

All dosing machines require regular servicing and maintenance by a competent contractor but can save the pool plant operator a considerable amount of time. Schools are advised to set up a maintenance contract with their swimming pool contractor.

Topline

This company also manufactures and installs a range of pool controllers. This controller is installed in new hydrotherapy pools. The manufacturer's servicing and maintenance instructions should be complied with and records of all servicing and maintenance should be kept.

Amperometric and Redox Probes

Amperometric probes are more accurate and reliable than redox probes and should be used in preference to redox probes. If you already have redox probes installed you are advised to upgrade to amperometric probes at the next pool plant upgrade.

3.7 EQUIPMENT FOR DOSING POOL CHEMICALS

Day Tanks and Bunds

All day tanks should be provided with a bund with a volume of at least 110% of the volume of the day tank so that if the day tank leaks the liquid will be trapped by the bund. Tanks containing incompatible chemicals must be well separated to minimise the risk of accidental mixing or splashing. If there is not room to separate them by the recommended distance then a barrier should be built between them. Day tanks should be prominently labelled with the name of the substance they contain

Refilling Day Tanks Safely

When refilling day tanks great care must be taken to ensure that the correct chemical is being used to fill that tank. If the wrong substance is fed into the wrong tank substantial volumes of chlorine are likely to be produced with very serious consequences.

Hand operated pumps can be installed to avoid the need for pouring significant quantities of hazardous substances from one container to another. Each pump should be labelled to indicate which substance is to be pumped by it. Pumps will need cleaning and maintenance from time to time.

Cleaning Bunds

Dosing solutions may splash or spill into bunds from time to time and when the liquid evaporates may leave a residue of solid material in the bund. The bund will need to be kept clean and the solid material will need to be removed regularly. When cleaning the bunds clean one at a time and take care not to mix the residues from the different bunds as this may result in chlorine gas being given off. Wear personal protective equipment to protect you from any splashes of hazardous chemicals.

Labelling of Day Tanks and Bunds

Day tanks and bunds must be clearly labelled with the name of the substance they hold and also the appropriate hazard warning symbol. It is important that the labels and symbols are large enough to be easily seen and that they do not peel off the tank or become made illegible by chemical splashes.

Separation of Day Tanks

Day tanks for different substances which are being dosed into the pool must be well separated to minimise the risk of accidentally mixing substances which will react together and produce toxic chlorine gas. If needed a barrier should be sited between them to minimise the risk of chemicals being mixed accidentally.

Dosing Pumps

It is wise to hold on site at least one spare dosing pump in case one fails. This enables the visiting engineer to fit a new dosing pump immediately rather than having to wait for one to be ordered and delivered which may take several days. Having a spare dosing pump(s) available can considerably reduce the down time of the pool when there is a malfunction.

PLEASE NOTE

IT IS MOST IMPORTANT THAT THE DOSING PUMPS ARE INTERLOCKED WITH THE CIRCULATION PUMPS SO THAT IF THE CIRCULATION PUMPS FAIL THEN THE DOSING PUMPS ARE SWITCHED OFF.

Dosing Tubes

Dosing tubes should be protected from damage by enclosing them in a more robust pipe of larger diameter. The contents of the pipe should be labelled at various points along its length to indicate what substance it is carrying. The direction of flow in the pipe should be labelled with an arrow indicating the direction of flow

3.8 EROSION FEEDERS

Trichlorinators

When installing a new trichlorinator it is wise to purchase a commercial duty one such as a Chlorilong trichlorinator from Biolab UK rather than a domestic type trichlorinator. The commercial trichlorinators are more expensive than the domestic ones but are much more robust and are likely to be more reliable and also to last longer than a domestic model and are also more capable of handling higher bioloads resulting from the use of the pool by groups of children. These are available in different sizes to match the size of the pool. See Appendix N for model instructions for a trichlorinator. The maximum bather load of the pool must never be exceeded.

Recharging the Trichlorinator

Following a COSHH assessment personal protective equipment including respiratory protective equipment should be worn when recharging the trichlorinator to protect against liquid splashes and inhalation of chlorine gas. The manufacturer's instructions should be displayed on the wall by the trichlorinator and should be followed carefully.

Discharging the Trichlorinator

Personal protective equipment including respiratory protective equipment should be worn when discharging the trichlorinator to protect against liquid splashes and inhalation of chlorine gas.

Maintenance of the Trichlorinator

The trichlorinator should be cleaned and maintained annually by a competent pool plant engineer in accordance with the manufacturer's instructions. Records of servicing and maintenance should be kept on the swimming pool file

Brominators

Following a COSHH assessment the County Council does not recommend the use of brominators in school pools although a small number of pools still use them. Chlorine is considered to be the most effective way of disinfecting a pool and chlorine levels are easier to measure and control than are those for bromine. Chlorination is chemically simpler than bromination and a small number of chemicals are required for chlorination than bromination. Chlorine is less likely to cause a skin rash than bromine (bromine itch)

Recharging the Brominator

Personal protective equipment including respiratory protective equipment should be worn when recharging the brominator to protect against liquid splashes and inhalation of bromine vapour. The manufacturer's instructions should be displayed on the wall by the brominator and should be followed carefully.

Discharging the Brominator

Personal protective equipment including respiratory protective equipment should be worn when discharging the brominator to protect against liquid splashes and inhalation of bromine vapour. Generally it should be carried out by the pool maintenance contractor. There should always be a means of summoning help in an emergency when this operation is being carried out.

Maintenance of the Brominator

The brominator should be cleaned and maintained annually by a competent pool plant engineer in accordance with the manufacturer's instructions. Records of servicing and maintenance should be kept on the swimming pool file

3.9 SWIMMING POOL CHEMICALS

Purchase and Delivery of Chemicals

Chemicals should only be purchased from reputable suppliers which specialise in production of chemicals for the swimming pool industry and guarantee quality. Purchase of chemicals from non-reliable sources can have serious consequences for the swimming pool plant and users as substances may not be of adequate purity. The purchase of chemicals from domestic suppliers should be avoided where possible as the quality of the chemicals cannot be guaranteed.

Labelling of Containers of Pool Chemicals

Ensure that the containers of pool chemicals are correctly labelled when they arrive and date stamp them so that they can be used in the correct sequence. Some chemicals have a comparatively short shelf life so it is important they are used up fairly quickly. Check also that the containers remain identifiable and adequately labelled when they are in store.

Avoid transferring chemicals from their original container to new ones if possible. If you do have to transfer a substance into a new bottle make sure the new container is correctly labelled with the same information that appears on the original container.

Labels may easily become damaged and unreadable owing to water and chemical splashes. It is important that they are checked regularly and are replaced when necessary so that the chemicals remain identifiable. If any substance does become unidentifiable owing to the loss of the label it should be safely disposed of by a licensed waste contractor.

Safety Data Sheets (SDS)

Suppliers must provide Safety Data Sheets (SDS) (formerly known as Materials Safety Data Sheets (MSDS)) when they first supply a substance and when the data sheet is updated. The safety data sheet is required in order to decide whether a COSHH Assessment is required and it is one of the essential sources of information for making a COSHH assessment. A safety data sheet is not in itself a COSHH assessment.

Technical Data Sheets (TDS)

Some companies also provide technical data sheets with their chemicals which explain how they should be used. These can be very helpful and may often be found on the company website.

Control of Substances Hazardous to Health Assessments (COSHH)

All substances which are classified as hazardous under the COSHH regulations which display a statutory hazard warning label on the product container require a COSHH Assessment to be completed. Substances which are not classified under the COSHH Regulations still need handling with care and the guidance on the safety data sheet should be read and followed.

A number of model COSHH assessments for substances commonly used in swimming pool maintenance are available on the Schools Web. These may be downloaded and adapted for use but they must be signed and dated by the user and be regularly reviewed for them to have any validity.

For further information on COSHH assessments see the Buckinghamshire Health and Safety Policies and Procedures Section 4.1 Control of Hazardous Substances COSHH.

3.10 CHEMICAL STORAGE

Security

The chemical store must be kept secure to prevent unauthorised access. Keys should be issued to authorised persons only and a list of key holders should be kept. A spare key should be kept in the school's key safe for use in an emergency.

Signage on Door of the Chemical Store

A sign indicating the commercial name, chemical contents and hazard warning symbol of each substance in the chemical store should be clearly displayed on the door of the chemical store and plant room. This is required by the Fire and Rescue Service so there is a clear warning of the presence of hazardous substances in the area to fire fighters.

Separation of Chemicals

All chemicals should be stored well apart in their own section of the store which should be clearly labelled to indicate what substances should be stored where. It is particularly important that the chlorine or bromine release agents are kept well apart from other chemicals which may react with it and liberate a toxic gas such as acidic substances. Incompatible chemicals must not be stored above each other.

Containers of hazardous chemicals should be stored in separate robust plastic containers with lids. The containers should be labelled with the name of the substance they contain. Substances which may react with one another should be stored as far apart as possible. Containers like salt and grit bins can be used for this purpose provided they are clean/new and stored securely.

3.11 SAFETY EQUIPMENT

Fire Extinguishers

The pool plant room should be supplied with a carbon dioxide fire extinguisher which should be located on a hook on the wall near the door. A sign should be located by it indicating the type of fire extinguisher and the type of fire it can be used on.

First Aid

A First Aid Box should be kept in the plant room in case of emergencies. Its contents should be checked termly including the expiry dates of each item.

For further information see Buckinghamshire Health and Safety Policies and Procedures Section 8.5 First Aid at Work.

Eyewash Stations

A tube on a tap should be available if possible as this is the most effective method of washing out the eyes. If a tube on a tap is not available an eyewash station should be available located in a prominent and readily

accessible position. Eyewash bottles must be sealed and in date. Any that are opened and used should be immediately disposed of.

3.12 SPILLAGE OF CHEMICALS

Spill Kits

A chemical spill kit should be kept readily accessible in the plant room and will contain absorbent booms for restricting the spread of spillages and absorbent pads for soaking them up. A dustpan and brush and a container with a tight fitting lid should be available for disposing of spillage material after it has been cleaned up. Spill kits are available from swimming pool suppliers such as Biolab UK, and Leisureteq,

Spillage Procedure

A written spillage procedure should be displayed on the wall near the spill kit and copy should be kept in the swimming pool file. A Model Chemical Spillage Procedure is provided in Appendix F. This can be adapted by the school for its use.

Disposal of Spillages

Significant spillages must be disposed of legally through a licensed waste contractor and a waste transfer notice should be obtained and kept on file for three years.

3.13 PERSONAL PROTECTIVE EQUIPMENT

Equipment Type

The following personal protective equipment should be available to the pool carers. They should be issued individually and should not be shared for reasons of hygiene.

- Hard Hats
- Ear Defenders
- Full Face Respirator
 - Canisters (A2,B2,E2,K2,P3)
- Half Face Respirator
 - Canisters (A1,B1,E1,K1,P3)
- Chemical Face Visor
- Chemical Goggles
- Chemical Proof Apron
- Chemical Proof Gauntlets
- Chemical Proof Boots

For further information please see Buckinghamshire Health and Safety Policies and Procedures Section 11.1 Personal Protective Equipment (b)(c)(d)(e)(f)

The PPE provided must all be compatible.

Please note that respirators used for protection against organic gases and vapours such as those given off by adhesives, solvents or pesticides and herbicides will not give protection against chlorine and bromine which are inorganic gases. It is important that the correct canisters are used otherwise they will not provide the appropriate protection.

Face Fit Testing of Respiratory Protective Equipment (RPE)

Schools will need to arrange for pool operators and pool carers to have their respiratory protective equipment face fit tested to ensure it is effective. The face fit testing will be carried out by an external contractor (Arco add contact details) who will issue a certificate. Testing can be done individually but it is more cost effective for a group of schools to co-ordinate their testing with the contractor at one central site

3.14 POOL CHEMICAL PARAMETERS /POOL WATER TESTING

Pools using Chlorine Disinfection

Test equipment will need to be available to enable the following tests to be carried out. The free chlorine, total chlorine and pH tests will need to be carried out regularly throughout the day in accordance with the pool's Normal Operating Procedure (NOP).

The combined chlorine should never be more than 50% of the free chlorine and should never be greater than 1 mg/litre (parts per million).

Example 1

| | | |
|--------------------------------------|---|---|
| Free chlorine ((DPD No1) | = | 2.0 ppm |
| Total chlorine (DPD No 1 + DPD No 3) | = | 2.5 ppm |
| Combined chlorine | = | 2.5 ppm (total) -2.0 ppm (free) |
| | = | 0.5 ppm which is less than 50% of 2.0 ppm |

This result is satisfactory

Example 2

| | | |
|--------------------------------------|---|---------------------------------------|
| Free chlorine (DPD No1) | = | 1.5 ppm |
| Total chlorine (DPD N0 1 + DPD No 3) | = | 3.0 ppm |
| Combined chlorine | = | 3.0 ppm (total) -1.5 ppm (free) |
| | = | 1.5 ppm which is more than 50% of 1.5 |

This result is unsatisfactory

The other tests will need to be carried out weekly and the Langelier calculation completed.

In pools using isocyanurates or where cyanuric acid is added the cyanuric acid level should be measured weekly.

| | |
|-------------------|---------------------------------------|
| Free chlorine | (DPD No1 tablet) |
| Total chlorine | (DPD No 1 tablet and DPD No 3 tablet) |
| Combined Chlorine | (Calculated from above results) |

pH (phenol red)

pH should be between 7.2 and 7.8 and preferably between 7.2 and 7.4.

Total Alkalinity (use photometer if 5 in 1, 6 in1 or 9 in 1 photometer)
(use tablet count if 3 in 1 photometer)

Calcium Hardness (use photometer if 6 in1 or 9 in1 photometer)
(use tablet count if 5 in 1 or 3 in 1 photometer)

Pool Temperature (thermometer)

Cyanuric Acid (Pools dosed with isocyanurates only)
Total Dissolved Solids (Total Dissolved Solids (TDS) Meter)

Pools using Bromine Disinfection

Free Bromine (DPD No 1 tablet (bromine))

Free bromine should be between 4.0 and 6.0 mg/l (ppm)

pH (phenol red)

| | |
|------------------------|--|
| Total Alkalinity | (use photometer if 5 in 1, 6 in 1 or 9 in1) (use tablet count if 3 in 1 photometer) |
| Calcium Hardness | (use photometer if 6 in 1 or 9 in 1 photometer) (used tablet count if 5 in1 or 3 in 1 photometer) |
| Pool Temperature | (thermometer) |
| Total Dissolved Solids | (Total Dissolved Solids (TDS) Meter) |

Langelier/Balanced Water Test

A Langelier or balanced water test should be carried out each week and the Langelier Coefficient should be calculated. This will indicate if the water is balanced, corrosive or scale forming and by measuring it every week any trends can be identified and corrective action can be taken to prevent damage to the pool and pool plant.

3.15 POOL WATER TEST EQUIPMENT

Types of Pool Water Testing Equipment

There are two types of pool test kits, photometers and comparators. Photometers give much more accurate readings and are recommended for use in Buckinghamshire School pools.. Schools are advised to purchase good quality instruments from companies such as Lovibond (The Tintometer Limited) or Palintest ,these instruments are supplied by the companies such as Biolab UK, Leisureteq and J P Lennard.

Operators need to be trained to use their test kits including the importance of a good light source so that they obtain accurate results.

Tablet reagents must be stored in a cool dry place Tablet reagents are usually provided in individually packed foil strips to prolong shelf life and prevent contamination before use. It is important not to touch the tablets when opening them for testing as this can affect the accuracy of the test result. It is advisable to purchase new tablet reagents each year and to safely dispose of old ones.

Note: The test reagents used in photometers are different to those used in comparators and it is important that the appropriate tablet for the make of equipment is used. If you have Lovibond Photometer then use Lovibond Photometer test tablets. If you have a Palintest Photometer then use Palintest Photometer Tablets.

The shelf life of the reagents used in the water testing equipment must not be exceeded. They should be stored in a cool dry place and be kept out of sunlight. Any liquid reagents need to be replaced at regular intervals to ensure they remain active. The bottles must be adequately stoppered or closed

Photometers

Photometers eliminate the need for colour matching. They take an absorbance reading of the test solution and change it into a digital readout in mg/litre. Photometers are sensitive instruments and will give a reading up to an accuracy of 0.01 mg/litre if used carefully. If they are to function effectively then they must be handled carefully, kept scrupulously clean and be calibrated annually at a calibration centre approved by the manufacturer. The annual calibration certificate should be kept in the swimming pool file for at least three years.

Comparators

Comparators are more robust but they are less accurate than photometers but may be used for back up if the photometer malfunctions or is away for calibration. They also need to be handled with care and to be kept scrupulously clean so that they will give accurate readings.

3.16 RECORD KEEPING

Backwash Records

Backwashing should take place at least once a week. Records of all backwashing that has been carried out should be kept on file including which filter was backwashed together with the date and time of the backwash and the signature or initials of the person carrying it out. The length of time for which the backwash took place and any problems encountered should also be recorded. These records should be kept for three years.

Contamination Records

Records of the date and time of any contamination incidents and the nature of the incident and the actions taken to resolve them should be kept on the swimming pool file for three years.

Pool Water Temperatures

The Pool Water Treatment Advisory Group (PWTAG) advises the following range of temperatures for different types of indoor or covered pools.

| Activity | Recommended Temperature Range |
|---|--------------------------------------|
| Competitive swimming and diving, fitness swimming, training | 26°C to 28°C |
| Recreational swimming, adult teaching | 27°C to 29°C |
| Leisure Waters | 28°C to 30°C |
| Children's teaching | 29°C to 31°C |
| Babies, young children, disabled and infirm | 30°C to 32°C |
| Hydrotherapy | 30°C to 35°C |
| Spa Pools | 30°C to 40°C |

There are good reasons for not running pools at higher temperatures than necessary:

- Micro-organisms multiply faster at higher temperatures. They may multiply up to twice as fast for a rise of 10°C.
- Bathers become hotter at higher water temperatures and this can limit serious swimming and increase the sweat and grease in the water.
- Increased perspiration will add to the ammonia and urea in the pool producing more combined chlorine. Chlorine demand will then increase simply to maintain the free chlorine levels.
- Increased levels of urea will increase the production of irritant nitrogen trichloride.
- Dissolved gases become less soluble at higher temperatures. This can result in more unpleasant odours such as chloramines and potentially harmful trihalomethanes and pH values rise as carbon dioxide escapes.
- Both direct and indirect energy costs will be higher whatever energy efficiency and conservation methods are used.
- Air temperature which is linked to water temperature rises also and this can make the atmosphere less comfortable for staff and others as can higher moisture levels.

- There is more moisture in the pool atmosphere even when the relative humidity is controlled at the same level. This can lead to a risk of condensation and possibly corrosion and deterioration of the building fabric, structure and equipment.

4.0 REFERENCES

HS(G) 179: Managing Health and Safety in Swimming Pools (HSE)

Third Edition Published 2003 ISBN 0 7176 2686 5

A copy of this book was sent to all schools with the original swimming policy in 2006. A copy can be purchased from the HSE or be downloaded free from the from the HSE Website www.hse.gov.uk.

PWTAG Pool Water Treatment Advisory Group – Swimming Pool Water Treatment and quality standards for pools and spas

ISBN 0951700766

Greenhouse Publishing Ltd, The Hollies, Botesdale, Diss, Norfolk, IP22 1BZ.

Telephone 01379 890721

Email greenhousebooks@btconnect.com

British Standards Institution (BSI) – Management of Public Swimming Pools – Water treatment systems, Water Treatment Plant and Heating and Ventilation Systems – Code of Practice. PS39:2003

BSI 389 Chiswick High Road, London. W4 4AL.

For Pool Inspections/Audits

Mike Shuff M.I.S.P.E

Managing Director

Carlton Associates Ltd

41 Lyndon Road

Olton

Solihull

West Midlands

B92 7RE

Tel: 01217 060084

www.carltonassociates.co.uk