

ENVIRONMENTAL HEALTH

PUBLIC HEALTH GUIDELINES FOR AQUATIC FACILITIES

August 2006

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- WA Department of Health: *Draft Code of Practice for the Design, Construction, Operation, Management and Maintenance of Aquatic Facilities 2005.*

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1. Foreword

These guidelines have been prepared to ensure public aquatic facilities are designed, constructed, operated and maintained to consistently high public health and safety standards, by minimising the occurrence of disease, injury and other health-related complaints associated with the use of these facilities.

The guidelines are aimed primarily at designers, builders and operators of aquatic facilities, together with authorised officers and other agencies.

These guidelines replace the following three documents:

- DHCS *Water Quality and Hygiene Standard for Swimming, Diving, Water Slide and Paddling Pools*, 1995.
- DHCS *Water Quality and Hygiene Standard for Spa and Hydrotherapy Pools* 1995.
- DHCS *Guidelines for the Safe Operation and Maintenance of Children's Wading Pools*, 1995.

Although these guidelines are intended to be a fairly comprehensive document, prospective applicants need to be aware that they may need approval from other regulatory mechanisms not documented herein.

The Environmental Health Program gratefully acknowledges the kind assistance provided by local and interstate colleagues in the development of these guidelines as well as relevant information obtained in the following documents consulted.

- Department of Health Services: *The Design, Construction, Operation and Maintenance of Public Swimming Pools*. California USA 1986.
- Standards Association of Australia: *Australian Standard 3634 Solar heating systems for swimming pools*. Standards Australia, Homebush, NSW, Australia 1989.
- ACT Department of Health and Community Care: *A Code of Practice to Minimise the Public Health Risks from Swimming / Spa Pools, Part A: General Guidelines*. Canberra, Australia 1998.
- ACT Department of Health and Community Care: *A Code of Practice to Minimise the Public Health Risks from Swimming / Spa Pools, Part B: Control of Cryptosporidium and Giardia*. Canberra, Australia 1998.
- Department of Health Services: *The Design, Construction, Operation and Maintenance of Public Swimming Pools*. California USA, 1986.
- National Environmental Health Association: *Model Pool Code*. Denver, Colorado USA, 1997.
- NSW Department of Health, *Public Swimming Pool and Spa Pool Guidelines*, Sydney NSW, 1996.
- NSW Department of Health: *Protocol for Minimising the Risk of Cryptosporidium Contamination in Public Swimming Pools and Spa Pools*. Sydney NSW, 1999.
- Queensland Health: *Code of Practice for the Control of Cryptosporidium and Giardia in Swimming Pools, Leisure Pools, Spas and Hydrotherapy Pools*. Brisbane, Queensland, 1998.
- South Australian Health Commission: *Standard for the Operation of Swimming Pools and Spa Pools in South Australia*. Adelaide, South Australia, 2002.

- Standards Association of Australia: *Australian Standard 2610 Spa pools – public spas*. Standards Australia, Homebush, NSW, Australia, 1993.
- Standards Association of Australia: *Australian Standard 3533.2 Amusement rides and devices. Part 2: Operation and maintenance*. Standards Australia, Homebush, NSW, Australia, 1997.
- VIC Department of Human Services: Swimming Pools and Spas
<http://www.health.vic.gov.au/environment/water/swimming.htm>
- WA Department of Health: *Draft Code of Practice for the Design, Construction, Operation, Management and Maintenance of Aquatic Facilities*. Perth Western Australia 2005.

2. Standards Adopted By Reference

- *Building Code of Australia*
- *Australian and New Zealand Standards:*
 - AS/NZS 1926.1: *Swimming pool safety, Part 1: Fencing for swimming pools*
 - AS/NZS 1838: *Swimming pools – Remoulded fibre-reinforced plastics – Design and fabrication*
 - AS/NZS 1839: *Swimming pools – Premoulded fibre-reinforced plastics – Installation*
 - AS/NZS 2560.2.5: *Guide to sports lighting – Specific recommendations – Swimming pools*
 - AS/NZS 3000: *Wiring Rules*
 - AS/NZS 2927: *The storage and handling of liquefied chlorine gas*
 - AS/NZS 1768: *Lightning Protection*
 - AS/NZS 1668.2: *The Use of Ventilation and Air Conditioning in Buildings- Ventilation Design for Indoor Air Contaminant Control*
 - AS/NZS 3780: *The Storage and Handling of Corrosive Substances*
 - AS/NZS 1926.3: *Swimming pool safety – Water recirculation and filtration systems*
 - AS/NZS 2610: *Spa pools – public spas.*
 - AS/NZS 3739: *Hydrotherapy Pools*
- *National Plumbing and Drainage Code*
- NHMRC *Australian Drinking Water Guidelines* are referenced for potable water in these guidelines.
- *NT Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.*

Northern Territory legislation and supporting documents, the *Building Code of Australia*, and the Australian and New Zealand Standards are widely referenced in these guidelines. Only their most recent version and amendments are to be used as source documents

Other References

- Australian Building Codes Board: *The Building Code of Australia*. CanPrint Communications, Canberra Australia 1996: F2.3 and 2.4.
- Standards Association of Australia: *Australian Standard 1926.1 Swimming pool safety, Part 1: Fencing for swimming pools*. Standards Australia, Homebush, NSW, Australia 1993.
- Standards Association of Australia: *Australian Standard 1838 Swimming pools – Remoulded fibre-reinforced plastics – Design and fabrication*. Standards Australia, Homebush, NSW, Australia 1994.
- Standards Association of Australia: *Australian Standard 1839 Swimming pools – Premoulded fibre-reinforced plastics – Installation*. Standards Australia, Homebush, NSW, Australia 1994.

- Standards Association of Australia: *Australian Standard 3000 Wiring Rules*. Standards Australia, Homebush, NSW, Australia 2000.
- Standards Association of Australia: *Australian Standard 2927 The storage and handling of liquefied chlorine gas*. Standards Australia, Homebush, NSW, Australia 2001.
- Standards Association of Australia: *Australian Standard 1768 Lightning Protection*. Standards Australia, Homebush, NSW, Australia 1991.
- Standards Association of Australia: *Australian Standard 1668.2 The Use of Ventilation and Air conditioning in Buildings-Ventilation Design for Indoor Air Contaminant Control*. Standards Australia, Homebush, NSW, Australia 2002.
- Standards Association of Australia: *Australian Standard 1926.3 Swimming pool safety – Water recirculation and filtration systems*. Standards Australia, Homebush, NSW, Australia 2003.
- Standards Association of Australia: *Australian Standard 2610 Spa pools – public spas*. Standards Australia, Homebush, NSW, Australia 1993.
- Standards Association of Australia: *Australian Standard 3739. Hydrotherapy Pools*. Homebush NSW, Australia. 1993.

3. Introduction

We are fortunate in the Northern Territory to have a climate that allows us to spend much of our leisure time outdoors. Aquatic facilities such as swimming and spa pools have become an integral feature of Territory life, and many people now participate in swimming and other water activities for recreational and health reasons.

There are significant benefits to be gained from these types of activities. Swimming and aqua-aerobics can increase cardiovascular fitness and flexibility, relieve stress and have rehabilitative benefits after injury. Most importantly however, they can be an enjoyable way to spend time with family and friends.

Owners and operators of aquatic facilities need to ensure their premises are hygienic and provide a high degree of bather comfort. There is a public expectation that facilities will be designed, operated and maintained in such a manner that they will pose no risk to the safety or health of their patrons. Improper design, maintenance or operation can result in aquatic facilities becoming a source of infection and injury.

Aquatic facilities need to be equipped with water treatment processes that provide continuous disinfection, which is capable of quickly and effectively killing disease-causing micro-organisms, to prevent diseases being transmitted to other patrons. Proper design and operation of facilities can enhance the action of the disinfection process.

Special care needs to be taken with spa pools, hydrotherapy pools and other facilities that operate with elevated water temperatures, as they provide environments that are even more conducive to the survival and growth of disease causing micro-organisms.

Aquatic facilities may be used by people of varying ages, states of health and standards of hygiene. These people introduce a range of pollutants to the water, including saliva, urine and other body secretions, skin, hair, and sunscreen lotions. Other sources of pollutants include dust, bird droppings, tree leaves, lawn clippings, make-up water, soil and untreated reticulation water. All of these pollutants can be accompanied by a variety of micro-organisms, some of which have the ability to survive and even multiply in recreational water. A number of the micro-organisms have the ability to cause infections in various parts of the body, such as the eye, ear and skin, gastrointestinal and nervous systems.

Consequently, operators and owners of aquatic facilities need to ensure water treatment processes provide continuous disinfection, which is capable of quickly and effectively killing disease-causing micro-organisms, to prevent diseases being transmitted to other patrons. Proper operation and maintenance of facilities can therefore enhance the action of the disinfection process.

Special care needs to be taken with spa pools, hydrotherapy pools and other facilities that operate with elevated water temperatures, as they provide environments that are even more conducive to the survival and growth of disease causing micro-organisms.

Correct use of chemicals employed to disinfect the water is required, as inappropriate use can cause patrons to suffer irritation of the eyes and skin conditions such as dermatitis. Approved methods of water treatment and disinfection are set out in these guidelines.

The provisions of these guidelines do not remove the need to comply with other laws of the Northern Territory.

The guidelines will operate for a trial period, before being gazetted formally and adopted as Public Health Standards for Aquatic Facilities.

4. Definitions

Approved Process of Cleaning	A process whereby bathing costumes and towels for loan or hire are thoroughly washed in water with soap or detergent, or by a process of dry cleaning.
Aquatic Facility	A man-made body of water used for sport, recreation or educational water activities.
Aquatic Facility Concourse	That part of an aquatic facility that is directly adjacent to an aquatic facility water body.
Aquatic Facility Water Body	That part of an aquatic facility used for aquatic activities.
Authorised Officer	A person authorised and appointed by the Chief Health Officer or their delegate to exercise powers under the <i>Public Health Act</i> for the purpose of enforcement of that legislation.
Bed and Breakfast Establishment	An owner-occupied dwelling providing accommodation and breakfast for transient paying guests.
Biofilm	A complex of micro-organisms held in a slime layer often covering the inner surface of pipes.
Bubble Pool	A man-made pool or other water-retaining structure designed for human use, which has a capacity of not less than 680 litres, which is connected to equipment for injecting air bubbles or jets of water under pressure, so as to cause general turbulence in the water.
Chief Health Officer	The person holding or occupying the office of Chief Health Officer as referred to in Clause 5 of the <i>Public Health Act</i> .
Coliforms	Bacteria that originate from the gut of warm blooded animals and are used as indicators of faecal contamination.
Cryptosporidiosis	A gastrointestinal illness caused by <i>Cryptosporidium parvum</i> .
Deep Water	An aquatic facility water body with a water depth at any location equal to or greater than 1.8m and is required to be appropriately signed.
Disinfection	The treatment of water to inactivate, destroy, and/or remove pathogenic bacteria, viruses, protozoa, and other parasites.
Diving Pool	A man made body of water used for competitive or recreational diving, including springboard or platform diving.
Hydrotherapy Pool	A pool containing heated water and designed to meet the therapeutic needs of persons of any age with impairments due to illness, injury, disease, and intellectual handicap, congenital defects or for fitness exercising, recreational and educational purposes.
Landing Pool	A body of water located at the exit of a waterslide, used to break the fall of waterslide users.
Leisure Pool	A swimming pool used for recreational purposes.
Off Season Period	Time of year during which an aquatic facility is not available for use.
Oocyst	Encapsulated egg that is the infective form of a parasite.

Operator	A person who is responsible for the daily operation and maintenance of an aquatic facility.
Outbreak	Two or more cases of a communicable (infectious) disease in the same place and time and with a common exposure; cluster has a similar meaning but usually refers to smaller numbers.
Radius of Curvature	The radius arc, which denotes the curved surface from the point of departure from the vertical side wall of the pool to the bottom of the pool.
River Ride	An aquatic facility that is designed to simulate the effects of a natural river, and incorporates a system to produce an artificial current of water, designed to propel patrons along without the use of a floating vessel.
Small Temporary Pool	A container of water less than 45 centimetres in depth that can readily be disassembled for storage and reassembled to its original integrity.
Spa Pool	A man-made pool or other water-retaining structure designed for human use, which has a capacity of not less than 680 litres, which may or may not be heated, which incorporates or is connected to, equipment for heating the water contained in it and injecting air bubbles or jets of water under pressure, so as to cause general turbulence in the water.
Spring Line	The point from which the pool wall breaks from vertical and begins its arc in the radius of curvature.
Substantial Alterations or Upgrade	Includes: <ul style="list-style-type: none"> • alteration to an aquatic facilities <ul style="list-style-type: none"> ○ concourse ○ floor gradient ○ disinfection, filtration and circulation systems ○ waterslides ○ diving platforms ○ water playgrounds • the addition of another swimming pool or spa pool to an existing filtration system • alterations does not include the repair or the replacement of existing equipment and systems already approved by the Chief Health Officer and does not apply to works that the Chief Health Officer considers to be of a minor nature.
Swimming Pool	A man-made structure capable of being filled with water and intended to be used for swimming, diving, wading or paddling, that cannot be emptied by a simple overturning of the structure. The definition does not include individual therapeutic tubs nor baths used for cleaning of the body.
Occupier	The owner, manager, trustee or other person or persons in charge of the aquatic facility.

Wading Pool	A swimming pool designed for wading, where the water depth is less than 300 mm.
Walkway	Any surface of an aquatic facility, other than the aquatic facility water body, that staff or patrons walk upon.
Water Playground	An area designed for children's play that incorporates a body of water. Water playgrounds may have undulating surfaces.
Waterslide	A device incorporating an inclined sliding surface, where a patrons body comes into direct contact with a water medium that is used to propel, or decelerate a body within a water flume, which terminates in a landing pool and/or watershed area.
Wave Pool	An aquatic facility designed to simulate the effects of a beach, and which incorporates a system to produce artificial wave motion.

5. Administrative Provisions

5.1 Application

These guidelines apply to all aquatic facilities, including swimming pools, exercise pools, wave pools, recreational pools, wading pools, diving pools, SCUBA diving training pools, spa pools, waterslides, hydrotherapy and other therapeutic pools, that are used or available for use by the general public, employees, customers, tourist like accommodation, recreational and leisure industries, swimming instruction facilities or members of a club, association or body corporate.

5.2 Commencement of Aquatic Facilities Guidelines

Aquatic facilities constructed prior to the commencement of these guidelines are not required to comply with the structural requirements, i.e. Section 3 of these guidelines unless they undergo substantial alteration or upgrade.

5.3 Classification of Aquatic Facilities

For the purposes of these guidelines, permanently located aquatic facilities shall be classified in accordance with the table below.

Table 1: Classification of Aquatic Facilities

Patron Access - Limitations	Classification of Aquatic Facility
Public access with limited restrictions such as age without an accompanied adult	Group 1 <i>Typical examples;</i> Aquatic Centres, Community Operated Facility, Waterslides
Restricted to discrete users and user groups	Group 2 <i>Typical examples:</i> Schools, Learn to Swim Centres Community Operated Facility, Hotels, Motels, Health Clubs, Resorts, Hydrotherapy Pools, Physiotherapy Pools, Caravan Parks, Recreational Campsites, Mine-sites, Places of Adult Entertainment
Restricted to owner/occupier residents and guests	Group 3 <i>Typical examples;</i> Aquatic Facilities in Flats, Home Units and other Strata-Titled Residential Premises, Bed and Breakfast facilities and Farm-Stay facilities

The Chief Health Officer may change the classification grouping of a facility, if considered appropriate based on the design and nature of use of the facility.

5.4 Approval Process

This does not remove the requirement to obtain approval from or comply with the requirements of other agencies.

Examples of other agencies from which approval may be required include but are not limited to:

- Power and Water Corporation (disposal of wastewater) where sewer connection is available
- Building Advisory Services – Department of Planning and Infrastructure
- NT WorkSafe (Storage of Hazardous Materials)
- Department of Local Government, Housing and Sport – Water Safety Branch (Pool Fencing).

5.5 Determining the Number of Patrons

The number of patrons in waterslide facilities shall be designated by the maximum number of persons permitted to use the waterslide at any one time.

The number of patrons for all other aquatic facilities is to be calculated by allowing one person for each 2.3 m² of water body surface area and allocating the final number as 50% male and 50% female.

6. Design and Construction Requirements

6.1 General Structural Requirements

Aquatic facilities shall be structurally sound, and engineered to withstand all forces imposed by the design of the facility and its anticipated use.

6.2 Construction Materials

Aquatic facilities are complicated structures that need to be designed to provide patrons with maximum levels of safety. Aquatic facilities can be subject to relatively large forces, from a range of sources, including hydrostatic pressures, overcrowding, etc.

Aquatic facilities can become harsh environments that impose unique requirements upon materials used for construction. Correct selection of materials is essential to ensure the longevity of a facility, and can assist with ongoing maintenance and care of a facility.

Aquatic facilities shall be constructed of materials that are non-toxic to humans under normal conditions of use, impervious, enduring, capable of withstanding design stresses, and provide a watertight structure.

6.3 Surface Finishes – Water Bodies

Designing and constructing aquatic facilities with appropriate surface finishes can contribute to the safe and hygienic operation of the premises. A suitable finish will also assist staff to carry out effective maintenance by enabling dirt and visible contaminants to be detected.

A suitable finish will also assist in safety by allowing submerged patrons to be easily seen. The use of non-slip floor materials will also reduce the risk of slip and fall injuries to patrons and staff.

The walls and floors shall be smooth, impervious, durable, easily cleanable, and continuous with no cracks, joints or protrusions other than structural joints. Floor surfaces shall be slip resistant.

6.4 Use of Sand and Earth Material

Clean sand or similar material, if used in a beach pool, shall only be used over an impervious surface.

The sand shall be specifically produced for use in such an environment, and used in such a manner as to not adversely affect the proper filtration, water treatment, maintenance, safety, sanitation, water clarity and operation of the overall aquatic facility. Positive up-flow circulation of water through the sand shall be provided at all times.

6.5 Obstruction and Entrapment

Eliminating entrapment zones in aquatic leisure equipment and ensuring adequate water depths are provided for certain aquatic activities can reduce the potential for serious injuries. The concourse directly surrounding aquatic facilities may also need to accommodate considerable amounts of water from a variety of sources. Depressions in the concourse can result in pooling of water, providing an environment conducive to the survival and growth of micro-organisms. Inadequate drainage can allow contaminated water to run back into the water body, while irregularities in the concourse surface may create slip and trip hazards.

Aquatic facility water bodies shall not be designed or constructed with obstructions that can cause patrons to become entrapped or injured. Examples include wedge or pinch-type openings and rigid cantilevered protrusions.

All edges and corners of facilities shall be rounded.

Fixtures and fittings in the walls and floors of the water body, shall be fitted flush and have no sharp and protruding edges.

6.6 Radius of Wall and Floor Junctions

Where a radius is required, the wall-to-floor junction radius in aquatic facility water bodies shall comply with the following requirements:

- the junction radius shall have its centre no less than 750mm below the water line
- the junction radius shall be tangent to the point where the radius meets the wall or the floor
- the junction radius shall not exceed 500mm. The radius shall be determined using the following formula:

Junction Radius = Water Depth – Vertical Wall depth (measured from the water line).

6.7 Minimum Water Depths

Aquatic facilities shall be designed and constructed so that water depths are appropriate for the expected usage of the facility.

6.8 Ventilation

Indoor aquatic facilities shall be provided with adequate mechanical ventilation systems in accordance with the provisions of AS 1668.2. "The use of ventilation and air-conditioning in buildings - ventilation design for indoor air contaminant control".

6.9 Lighting

Aquatic facilities while in use shall be provided with sufficient lighting to enable every part of the aquatic facility including the underwater area to be observed, without interference from direct or reflected glare from the lighting sources.

Aquatic facility concourses shall be illuminated in compliance with the above requirements to a distance of 3 metres from the water body. Indoor facilities shall be also be provided with appropriate lighting. All areas of waterslide facilities that are available to the public shall also comply with these requirements.

6.10 Concourses and Walkways

All concourses and walkways shall be provided with surfaces that are smooth, free of protrusions that may constitute a trip hazard, impervious, durable, easily cleanable, and continuous with no cracks or joints other than structural joints.

Adequate drainage shall be provided in all areas that may become wet. The concourse shall be graded to drain away from the water body to prevent water from accumulating on the concourse or draining back into water bodies. All general site and roof drainage shall be directed away from water bodies.

Garden areas adjacent to aquatic facilities shall be designed to prevent soiled water falling on the area from draining back into the water body.

6.11 Fencing and Security

All facilities shall be provided with security measures that will deter the unauthorised entry of persons whenever the facility is not in use.

All pool fencing and security measures are subject to the requirements of the, Department of Local Government Housing and Sport - Water Safety Branch.

6.12 Sanitary Amenities

Aquatic facilities shall be provided with toilets, showers and change rooms. Facilities shall be provided for persons using the aquatic facilities in accordance with the following table:

Table 2: Sanitary Amenities

Facilities	Male	Female
Water Closets	One water closet plus one urinal for every 60 male patrons	One water closet for every 40 female patrons
Showers	One shower for every 40 patrons	One shower for every 40 patrons
Hand basins	One hand basin for every 60 patrons	One hand basin for every 60 patrons

Toilets must be provided for spectators in Group 1, and Group 2 facilities in accordance with the requirements of parts F 2.3 and 2.4 of the *Building Code of Australia*, which are represented below.

Table 3: Provision of Toilets

Spectators Facilities	Maximum Number Serviced By								
	Closet Pans			Urinals			Washbasin(s)		
	1	2	Each Extra	1	2	Each Extra	1	2	Each Extra
Males	250	500	500	100	200	100	150	300	150
Females	75	150	75				150	300	150

Sanitary and ablution facilities shall be located within a suitable distance from the water body.

Toilets, showers and change rooms are to be provided with floors, which are impervious, slip resistant when wet, and sloped with a minimum grade of 1 in 50 to floor drains or other drainage facility.

Sanitary facilities are not required in Group 3 aquatic facilities, where bathers have access to toilet facilities in accommodation quarters.

6.13 Backwash Water

All onsite disposal of backwash water from aquatic facilities shall be disposed of in a manner approved by the Power and Water Corporation or Local Government Authority, where appropriate for disposal into the sewer or stormwater. Discharges may require a Waste Discharge Licence from the Department of Natural Resources, Environment, The Arts and Sport. All proposals for backwash water re-use systems shall be approved by the Chief Health Officer.

6.14 Safety Signage

All aquatic facilities shall be provided with signage that details acceptable patron behaviour, and other safety rules. The signage shall be displayed in a prominent location, and contain rules that are appropriate for the nature of the activities conducted at the premises. Recommended safety signage for swimming pools, spa pools and waterslides is contained in Appendix 1 of these guidelines.

6.15 Shade Protection

The provision of shade is recommended for all outdoor aquatic facilities.

In a number of cases, shade structures have been retrofitted to existing facilities. Careful positioning of such structures can ensure they do not obscure lighting provided by overhead lighting towers.

Where facilities choose to erect shade structures, they shall be positioned such that they do not obscure overhead lighting.

6.16 Electrical Safety

All electrical installations shall comply with AS 3000 "Wiring Rules".

6.17 Lightning Protection

Group 1 and Group 2 aquatic facilities shall be provided with lightning protection systems in accordance with AS 1768 "Lightning Protection".

6.18 Additional Requirements for Special Features

Child Amusement Devices – Leisure Pools

Child amusement devices shall be non-toxic, easily cleanable, and not pose a safety or health hazard to bathers.

The devices shall not interfere with water circulation or disinfection, or obscure supervision of patrons in the water.

Waterslides

Waterslides shall be designed to ensure maximum safety. All materials used for construction shall be durable, water resistant, easily cleansed and maintained.

The flume shall be designed to take into account human size, weight and movement to ensure that the rider stays within the predetermined design path of the flume and cannot be thrown out of, or into the flume.

All 'user contact' surfaces shall be assembled, arranged and finished smooth to prevent bodily injury to the riders.

Adequate drainage shall be provided at the base of the structure to ensure that any spillage over the sides of the flume is quickly drained to grass areas or floor drains.

The landing pool should be:

- either a designated or marked off area (that will reduce risk to the rider or pool user), or preferably, a dedicated pool for water slide use only, whilst the slide is in use
- clear of obstructions over the adequate stopping distance of a rider. The stopping distance is to be designated in the slide parameters
- free from any pool grates or drains within the landing area.

Hydrotherapy Pools

Hydrotherapy pools shall also comply with Australian Standard 3979 *Hydrotherapy Pools*

Spa Pools

Spa Pools shall also comply with Australian Standard 2610 *Spa pools – public spas*.

7. Circulation And Water Treatment Systems

7.1 Water Treatment

Aquatic facility water may be contaminated by a variety of pollutants from a number of sources. There are many factors that contribute to the contaminant loading on a water body including (but not limited to) bather load, water depth, temperature and the activities undertaken in the facility.

The pollutants may be accompanied by a range of micro-organisms, some of which have the ability to survive and multiply in the water and produce infections in patrons. Pollutants can also produce high levels of turbidity in the water. This can make the water aesthetically unappealing to patrons, interfere with the disinfection process and make detection of submerged patrons difficult.

Aquatic facilities require water treatment systems that can effectively remove pollutants and micro-organisms from the water. The treatment systems need the capacity to draw an adequate volume of contaminated water from the water body, efficiently remove pollutants, dose the water with the required level of disinfectant and distribute the filtered and disinfected water back through the water body.

Effective water treatment requires a combination of processes working together to provide water that is safe to swim in and of optimum quality. Among these, filtration and disinfection are critical processes with specific requirements.

The design of the aquatic facility and water treatment system shall be in accordance with the intended use of the facility and the anticipated bather loadings. At the time of application for approval, proponents of facilities shall nominate the required Bather Loading and proposed classification for each water body in the facility, in accordance with the table opposite.

7.2 Filtration

Filtration is used to remove contaminants that are present in the water either as colloidal solutions or suspended as particulate material.

The filtration system pumps soiled water through a filtration medium, which captures and retains the contaminants. The filtration medium may consist of sand, diatomaceous earth or other approved material. The captured contaminants are subsequently removed from the filter medium during a cleaning process such as backwashing.

Efficient filtration will remove a high proportion of contaminants from the water, enhancing the effectiveness of the disinfection process.

An additional role of the circulation system is to provide a continuous flow of water through the water body to mix and evenly distribute the disinfectant chemicals throughout the water.

The more heavily loaded a body of water, the more rapidly this water must be treated to remove contaminants. The "Water Body Loading Category Chart" in Table 4 is designed to establish the parameters of different levels of contaminant loading and specifies a Maximum Permissible Turnover Time for each Category of facility.

Table 4: Water Body Loading Category Chart

Category	Loading Classification	Parameters	Examples	Maximum Permissible Turnover Times
1	Extreme	Very High Bather Load, Very Shallow	Water Spa Pools, Leisure Bubble Pools, Toddlers Pool, Water Slide Splashdown Pool	15-30 min
2	High	Very High Bather Load, Heated Water, Shallow Water	Medium Depth Leisure Pool, Learn to Swim, Wave Pool, Shallow Leisure Pool, Hydrotherapy Pool	1- 1 ½ hour
3	Moderate	High Bather Load, Heated Water, Medium Depth Water	Full Depth Heated Leisure Pool, Lazy River, Medium Depth Unheated Outdoor Leisure Pool	2 hours
4	Light/Low	Medium –Low Bather Load, Heated Water, Medium-Deep Water	Heated School Pool, Health Club Pool, Body Corporate, Caravan Park, Motel Pools, Full Depth Unheated Outdoor Leisure Pool	2 ½ -5 hours

Every aquatic facility shall be provided with a circulation system consisting of one or more pumps, piping, suction outlets, return inlets, filters, disinfectant feeders, automatic water chemistry controls and other equipment necessary to maintain the specified water quality.

The circulation system shall be designed in accordance with the following requirements:

- The capacity shall accommodate 100% of the design turnover flow rate (under clean filter conditions)
- The system shall be capable of providing effective mixing of water in the water body and uniform water quality
- The system shall be capable of maintaining the specified disinfectant residual throughout all parts of the aquatic facility.

Aquatic facility water treatment systems shall be in operation whenever a facility is available for use and at such additional times and periods as may be necessary to maintain the water in a clean and disinfected condition.

This requirement applies to pumps, filters, disinfectant and chemical feeders, flow indicators, gauges and all related parts of the water treatment system.

Filtration Vessels

The design and construction of filtration vessels shall be:

- designed to achieve a uniform flow of water through the filter bed
- capable of withstanding normal and continuous use without deterioration that could affect the filter or filter operation
- designed to permit regular inspection and maintenance

- designed to permit adequate and effective cleaning or replacement of the media, to achieve design flow rates in filter and backwash mode
- constructed of corrosion resistant components
- where filter vessels permit the accumulation of air in the top of the vessel housing, the filter vessel shall be equipped with an air release system which evacuates the air automatically
- installed with all necessary pressure gauges and instrumentation
- clearly labelled with model, make, filter area, pressure rating and flow rates (in filter and backwash mode).

Other Filtration Requirements

Facilities shall comply with the following requirements:

- Filtration equipment shall be protected from tampering by unauthorised persons.
- Filtration equipment shall be mounted level on concrete or another surface, which is easily cleanable and non-absorbent.
- Plant room floors shall slope at a minimum 1:50 gradient towards a floor drainage system.
- Each filter vessel shall be installed so that it can be isolated from the recirculation system for repairs and backwashing.
- All water treatment plant shall be installed with sufficient access to enable them to be inspected and serviced in accordance with manufacturer's specifications and safe working practices.
- Filters cleaned by backwashing shall be provided with a readily observable sight glass, installed on the waste discharge line. Sight glasses shall be of full line diameter and readily removable for cleaning.
- Facilities utilising cartridge filters shall be provided with a wash-down area, with drainage connected to a waste disposal facility approved by the Power and Water Corporation or the Department of Natural Resources, Environment, The Arts and Sport..

7.3 Disinfection

The disinfection process involves adding a chemical to the water to destroy micro-organisms and oxidise chemical pollutants. To prevent transmission of infectious diseases it is essential that this process achieves rapid destruction of micro-organisms in the water without harming the bathers. It is also necessary to maintain a sufficient residual disinfectant in the water to rapidly destroy any micro-organisms introduced by patrons or other sources.

Chemical disinfection processes are generally centred around a chlorine or bromine compound, as they are the most effective chemicals that can safely be used in an aquatic facility. They may be used along with a number of other chemicals or processes (such as UV or Ozone) to improve their efficiency and reduce the creation of disinfection by-products.

Aquatic facilities shall be equipped with automatic disinfectant equipment that is capable of maintaining continuous and effective disinfection of the water under all conditions of use.

The equipment shall be capable of maintaining the water chemistry in compliance with the requirements of these guidelines.

Chemical dosing equipment shall be designed and installed to comply with the following requirements:

- Dosing pumps shall be regulated to accommodate varying supply or back pressures, and ensure the feed rate remains constant
- Control systems with graduated and clearly marked dosage adjustments shall be provided which are capable of providing flows from full capacity to 10% of such capacity
- Chemicals shall not feed into the water if the pumping equipment or power supply fails
- Operation of the system shall cease if there is inadequate flow of water through the filtration system that would prevent the chemicals from being properly dispersed throughout the aquatic facility water body
- Water shall not be permitted to siphon from the recirculation system to the water treatment solution container. Water treatment chemicals shall not be permitted to siphon from the solution container into the water body
- Make-up water supply lines installed on chemical solution feeder tanks shall have an air gap or other back-flow prevention device.

7.4 Requirements for Water Features

The water supply for all water features shall consist of filtered, disinfected water obtained from the return side of the filtration system. This requirement applies to water features such as waterfalls, fountains, mushrooms, or other design features through which water enters an aquatic facility.

High water volume features (water slides, rivers, etc) must draw their water from a chlorinated and filtered water supply. If any water is drawn from the balance tank directly into a water feature, all make-up water must be chlorinated before entering the balance tank, to achieve a minimum level of 1 milligram per litre free chlorine.

7.5 Special Requirements for Electrolytic Salt Chlorinators

As a by-product of this process is the production of hydrogen gas (which could accumulate in a pressure filter) Electrolytic Salt Chlorinators shall only be installed downstream of pressure filters.

Electrolytic Salt Chlorinators shall be electrically linked to the main circulating pump to prevent the chlorinator operating when the main circulating pump is switched off. Where the electrolytic salt cells are not designed to be located above the filter vessel gas detectors shall be fitted that will terminate the operation of the chlorinator in the event of hydrogen gas build up.

As an Electrolytic Salt Chlorinator cannot respond to instantaneous chlorine demand a backup chlorine system shall be installed, using gas, liquid or granular chlorine.

7.6 Chemical Safety

All chemicals used to treat aquatic facility water can be hazardous if not handled and stored properly.

Disinfectants are designed to kill micro-organisms, and in concentrated form they can be hazardous to staff and patrons.

A number of the chemicals are incompatible, and can react if mixed together. The manufacturers' Material Safety Data Sheet is a useful source of information on the storage, handling and use of chemicals.

Eye protection and gloves are recommended when handling these chemicals. Cleaning materials and pool equipment should be stored so as to prevent misuse.

Aquatic facilities are advised of the need to comply with the *Explosives and Dangerous Goods Act 2004* and the Explosives and Dangerous Goods Regulations 2004, which are administered by the NT WorkSafe.

7.7 Specific Requirements for Ozone Disinfection Systems

Facilities equipped with ozone water treatment systems shall comply with the requirements in Appendix 2 of these guidelines.

7.8 Solar Water Heating Systems

Aquatic facilities are increasingly employing solar water heating systems to maximise energy usage. To prevent contamination of the water these systems need to be designed to appropriate standards.

Solar water heating systems shall comply with the provisions detailed in Appendix 3 of these guidelines.

8. Water Quality And Testing

8.1 Introduction

Maintaining water quality is a fundamental role of operating an aquatic facility.

The objectives of an operator should be to:

- ensure the water is properly disinfected at all times, to prevent transmission of infectious diseases
- achieve maximum patron comfort.

It is important to regularly check the chemical and physical properties of aquatic facility water, and make adjustments where necessary. This will ensure the filtration and disinfection system is functioning correctly, and patrons are provided with maximum levels of hygiene and comfort.

8.2 Chemical Water Standards

Whenever an aquatic facility is available for use, the water needs to contain an adequate level of a chemical that can destroy micro-organisms. By far the most common chemical used for disinfection is chlorine. This material has the advantages of being a relatively low cost, highly effective disinfectant that is readily available.

However, chlorine is also a highly reactive chemical, which non-selectively combines with nitrogen-rich pollutants in the water, to produce unwanted chemicals known as chloramines. These give the water a characteristic pungent chlorine-like smell, and irritate the eyes and skin of patrons. Chloramines are also known to be less effective disinfectants than free chlorine. High concentrations of chloramines reduce the overall effectiveness of the chlorination process. The chloramine problem is generally worse in heavily patronised facilities, where patrons add large amounts of urea and other nitrogen-rich bodily wastes to the water.

A number of technologies are now available to reduce the levels of chloramines in water. Examples include the use of ozone gas, ultra-violet light irradiation, and the addition of non-chlorine oxidizing chemicals to the water. The use of these technologies should be considered for indoor aquatic facilities with significant bather numbers.

Techniques for measuring chlorine levels in water are well established. A variety of colorimetric techniques are available, using reagents and a comparator or photometer.

However, chlorine and pH levels alone are an insufficient measure of the efficacy of the disinfection process. The efficacy is determined by the activity level of the chlorine, which can be affected by a number of other factors.

The activity level of chlorine is measured by its oxidative capacity, otherwise known as the oxidation reduction potential. This parameter indicates the combined effect of all oxidizing materials in the water, and is expressed in millivolts.

Systems that monitor the oxidation reduction potential and pH are becoming widespread in the aquatic industry, as they provide operators with the ability to automatically control the water chemistry.

Where chlorine is used, the water chemistry shall be maintained in accordance with the requirements of the following table.

Table 5: Minimum Free Chlorine Levels

	Minimum Free Chlorine Levels– milligrams per litre	
	Water Temperature < 26°C	Water Temperature > 26°C
Unstabilised pools – cyanuric acid not used	1.0	2.0
Stabilised pools – where cyanuric acid is used	2.0	3.0
Minimum Free Chlorine Levels – milligrams per litre		
Spa and hydrotherapy pools	3.0	
Wading Pools and Small Temporary Pools	4.0	

Note: As an alternative to complying with this requirement, indoor facilities may comply with the free bromine levels specified in Table 6.

Combined Chlorine Levels

It is recommended that facilities be operated with combined chlorine levels no greater than 30% of the free chlorine levels.

Maximum Chlorine Levels

Total chlorine levels shall be no greater than 10 milligrams per litre whilst a facility is in use.

Free Bromine Levels

Some indoor facilities choose to use bromine disinfectants in place of chlorine. Bromine compounds possess a number of desirable properties including:

- reduced breakdown of the disinfectant at higher water temperatures (heated facilities)
- increased effectiveness of the sanitiser in water with high levels of organic contamination (produced by high bather loadings)
- reduced patron irritation from sanitiser by-products (bromamines are less irritating than chloramines).

Bromine is most commonly used in solid form as the chemical, Bromo-chloro-dimethylhydantoin (BCDMH). The bromine and chlorine components of this substance eventually degrade to inactive bromide and chloride, however the dimethylhydantoin (DMH) component does not break down and accumulates in the water. Elevated levels of DMH are believed to produce skin irritation problems in patrons, and can only be reduced by dilution with fresh water on a volume by volume basis. Facilities utilising bromine as a sanitiser shall keep the DMH levels no greater than 200 milligrams per litre.

Bromine is not suitable for use in outdoor facilities, as it cannot be stabilised against ultra-violet light degradation.

Indoor facilities electing to utilise bromine sanitisers shall ensure the water complies with the requirements of the table below.

Table 6: Minimum Free Bromine Levels

Facility	Minimum Free Bromine Levels (milligrams per litre)	
	Water Temperature < 26°C	Water Temperature > 26°C
Swimming pools, Wave Pools, Water Slide Receiving Pools	2.0	4.0
Hydrotherapy Pools, Spa Pools, Wading Pools	4.0	8.0

pH

The effectiveness of chlorine and other disinfectants is largely influenced by the pH of the water. Both chlorine and bromine lose their disinfection and oxidation capacity at higher pH levels. To ensure disinfectants achieve maximum effectiveness it is critical that the pH of the water is maintained within a defined range.

Addition of disinfectants, which can be strongly acidic or strongly alkaline, changes the pH.

The pH shall be maintained within the range 7.2 – 7.8.

Cyanuric Acid

Chlorine also undergoes significant degradation when exposed to sunlight. The degradation is caused by the ultraviolet light component of sunlight, and can be reduced by adding cyanuric acid to the water. This chemical binds to chlorine and shields it from the ultraviolet light.

A number of studies have been performed on cyanuric acid, some of which suggest that the chemical decreases the effectiveness of chlorine, and therefore increases the disinfection time. To compensate for this effect, cyanuric acid needs to be maintained within a specific concentration range, and used in conjunction with higher levels of chlorine.

Where cyanuric acid is used, it is to be maintained at a level of 30 – 50 milligrams per litre.

Alkalinity

Fluctuations in the pH levels can be minimised if correct alkalinity levels are maintained. The alkalinity is a measure of the ability of the water to resist changes in pH. The appropriate alkalinity level will depend upon the type of disinfection system used, and the material used to construct the water body.

The chemicals used to disinfect the water and adjust the pH, ultimately breakdown to produce salt. Unless the salt level is diluted, by emptying a sufficient volume and refilling with fresh water, the salinity level will gradually rise.

The alkalinity shall be maintained within the range 60 – 200 milligrams per litre.

Calcium Hardness

The calcium hardness shall be maintained within the range 50 - 400 milligrams per litre.

Total Dissolved Solids

The Total Dissolved Solids level (TDS) is a measure of the total quantity of salts dissolved in the water. It is advisable to prevent excessively high TDS levels from accumulating, as they may result in accelerated corrosion of metal components within the water bodies.

It is recommended that the TDS level be maintained at no more than 1000 milligrams per litre above the TDS level of the supply water, to an absolute maximum of 3000 milligrams per litre.

Facilities utilising salt water chlorination units shall maintain the TDS level in the range specified by the chlorination unit manufacturers.

Water Balance

It is recommended that operators ensure water is balanced in accordance with the Langlier Saturation Index, Taylor Index or other appropriate saturation index. Information on water balance is contained in Appendix 1 of these guidelines.

8.3 Physical Water Standards

In addition to water chemistry, it is important to ensure physical water quality parameters are maintained.

Aquatic facility water needs to be maintained to appropriate physical standards, to provide patrons with a comfortable and safe environment, and to ensure the disinfection process works efficiently.

Water Clarity

Water clarity is often the first feature patrons notice when entering an aquatic facility. Apart from its effect on aesthetic quality, water clarity is also an important factor in providing a safe environment. Excessive levels of turbidity in water can reduce the ability of lifeguards to detect submerged patrons. The particles that produce turbidity also reduce the efficiency of the water disinfection process, by shielding micro-organisms from direct contact with disinfectants. A variety of methods are available to control turbidity levels.

Aquatic facility water shall be kept clean and clear. Whenever a facility is open for use, the water shall have sufficient clarity to enable lifeguards to see a submerged patron on the bottom of the water body. This requirement shall be applied to measurements conducted on waterslide landing pools without the flume water flow operating.

8.4 Maximum Water Temperatures

Many aquatic facilities use water heating systems to facilitate patron comfort and enable the facility to be used throughout the colder months. The most appropriate operating temperature will depend on the type of facility.

Warmer temperatures are generally appropriate for facilities used for less strenuous activities such as hydrotherapy pools and spa pools, whilst lower temperatures are generally appropriate for facilities used for vigorous exercise, such as swimming training. Higher water temperatures can cause patron discomfort, increasing perspiration and elevating levels of contamination in the water. If an aquatic facility is operated with excessively high water temperatures, and patrons stay in the water for long periods, they may suffer an elevation in body temperature, which can have serious consequences. As it is difficult to control the time patrons spend in the water, it is important to ensure water temperatures do not exceed certain limits.

Aquatic facilities shall not be heated above 38°C.

8.5 Chemical Water Testing

Whenever an aquatic facility is open for use, the water chemistry shall be manually tested on a regular basis.

The water testing shall include measurement of the following parameters:

- Free chlorine / Free bromine
- pH.

The testing shall be performed in accordance with the following minimum frequencies:

- Group One Facilities: at least once every four hours
- Group Two Facilities: at least three times per day
- Group Three Facilities: at least once per day.

All facilities utilising isocyanuric acid shall perform water tests to measure the concentration of the chemical at least once per week.

Test kit reagents shall be stored in accordance with manufacturers' directions, and discarded upon reaching their expiry date.

8.6 Microbiological Water Standards

All aquatic facility water shall be maintained in accordance with the microbiological requirements of the table below.

Table 7: Microbiological Water Standards

Type of Organism	Maximum Count Allowable
Heterotrophic Plate Count	100 Colony Forming Units (CFU) per mL
Presumptive Total Coliforms	<1 per 100mL
Presumptive <i>Pseudomonas</i> spp (Only applies where water temperature is over 32°C)	<1 per 100mL
Thermophilic <i>Naegleria</i>	Not detected

All makeup water used in aquatic facilities shall also comply with this requirement.

8.7 Microbiological Water Testing

Operators shall be responsible for samples to be collected from all aquatic facility water bodies at least quarterly, and submit them to a NATA accredited microbiological testing laboratory. Test parameters should include: Total Coliforms, *P. aeruginosa*, Total Plate Count & Pathogenic *Naegleria*.

Water samples are to be taken from a depth of 300mm from the pump outlet, skimmer box inlet or from the backwash water. The sample transportation method shall comply with any requirements stipulated by the testing laboratory.

If the sample fails, the pool is to be re-sampled. Should the second sample fail then the local Environmental Health Office is to be contacted and an Environmental Health Officer will advise on appropriate remedial action to be undertaken.

Results of all water testing (microbiological and chemical) and maintenance procedures shall be recorded, and records kept by the facility for at least two years. The occupier of a facility shall produce the records for examination at the request of an Authorised Officer.

8.8 Cryptosporidiosis

Cryptosporidium parvum is the parasite responsible for cryptosporidiosis, a diarrhoeal illness in humans, but it can also occur in a variety of animals such as cattle and sheep. In an infected person, the parasite invades and multiplies in the gastro-intestinal tract, causing illness and producing oocysts, the infective form of the parasite. Oocysts pass out in the faeces to the environment where they can survive for a long time, including in water. As oocysts are resistant to standard levels of chemicals, such as chlorine and bromine used for pool disinfection, *Cryptosporidium* transmission in public swimming pools and spas is a real public health risk.

Test methodologies, currently based on a 100 litre water sample, are available to detect and enumerate *Cryptosporidium* oocysts but only represent the status of the water at the time of testing. Routine pool water sampling for *Cryptosporidium* is not recommended.

Negative results may give a false sense of security because sampling does not represent all of the pool water and a faecal accident may occur after sampling (as for any microbe including coliforms).

Testing for the parasite is expensive and there is a time delay before results are received. The primary tests do not determine whether the oocysts are alive or whether they are able to cause infections. Further, as the dose of organisms needed to cause an infection is unknown the concentration of oocysts detected has little meaning. The test involves large sample volumes, is expensive and does not provide the necessary information for making operating decisions.

Routine disinfection procedures, on their own, are not sufficient to quickly destroy *Cryptosporidium* oocysts, unless superchlorination is regularly practiced.

While chlorine and bromine at the recommended levels will eventually kill the oocysts over many days or even weeks, assuming no further contamination, the time lag is insufficient to protect swimmers from infection.

In the event of a cluster of cases of cryptosporidiosis and where a public swimming pool is implicated, in the subsequent investigation, consideration may be given to the temporary closure of the relevant pool(s).

Refer to Appendix 5 of these guidelines for further guidance on appropriate measures to minimise the risk of cryptosporidium contamination in public swimming pools and spa pools.

8.9 Superchlorination

Weekly or fortnightly superchlorination maintaining 10 mg/L free chlorine should be performed when swimmers are not present (usually overnight) for an eight hour period minimum.

- Superchlorination allows the pool to catch up on disinfection while there is no contamination entering the pool.
- It is much more effective at killing *Cryptosporidium* oocysts.
- It allows extra oxidation of organic contaminants and aids filtration, clarification and polishing of the pool water.
- It destroys biofilms that may develop on the inside of pipes. Biofilms may harbour *Cryptosporidium* oocysts.

Where it is suspected that an outbreak of cryptosporidiosis is related to a contaminated swimming pool or spa pool, a CT value (free chlorine concentration (mg/L) x time (minutes)) of at least 8,400 must be achieved in order to inactivate 99.9% of the oocysts. That is, the concentration (in mg/L) multiplied by the time (in minutes) must exceed 8,400. This equates to 10 mg/L free chlorine for 14 hours or 20mg/L for 7 hours. This regime should be monitored.

Liquid, stabilised chlorine dioxide has recently been introduced into the market for use as a shock dose similar to superchlorination and claiming superior inactivation of oocysts than free chlorine. From research data it appears that a CT value of about 100 will inactivate 99.9% of oocysts.

8.10 Off-Season Periods - Water Quality Maintenance

During the off-season, whilst an aquatic facility is not in use, operators shall ensure water clarity is maintained and algal growth prevented.

Aquatic facilities shall receive sufficient maintenance to ensure they do not give off objectionable odours, become a breeding ground for insects, or create any other nuisance or safety hazards. Maintenance of other water quality parameters is not required during the off-season. Signage must be displayed at all entry points into aquatic facilities clearly stating that the facility is closed.

9. General Sanitation and Operational Requirements

9.1 Introduction

Aquatic facilities are continuously subjected to contamination. The main source of contamination is material brought into the water by patrons. This includes bodily fluids and solids, urine, mucus from the nose, saliva, sweat, hair, skin and faecal matter. Others include dirt collected on the body before bathing, dirt on patron's feet from the concourse, unclean bathing costumes, cosmetics, oils, hairspray, lotions and sunscreen. A variety of contaminants may also be found in the replacement (make-up) water, and in run-off from rainwater and the environment.

Although these materials are pollutants in themselves, they may also be accompanied by a variety of microorganisms. Some of these microorganisms may be transmitted to patrons, where they can produce a range of infections. Strategies need to be implemented to minimise the risk of infections from these microorganisms. Many pollutants can be removed or inactivated by effective operation of the filtration system, and maintaining appropriate water chemistry and clarity standards.

Implementing patron hygiene and behaviour rules, including exclusion of persons who are unclean or carrying obvious infectious diseases, reduces the amount of contaminants entering the facility. Regular servicing and maintenance of the water treatment system along with other equipment and structures, will ensure all equipment is functioning at maximum efficiency. Structured cleaning programs assist in preventing the build up of microorganisms.

Animals can be a significant source of contamination and therefore are not permitted to enter water bodies.

Heat blankets are used in a number of facilities, as they are an effective means of reducing heat loss from water surfaces at night. Automatic cleaners are used to improve cleaning efficiency.

Inappropriate use of this equipment can create a number of hazards to aquatic facility patrons. Exposure of patrons to excessive chemical levels can be prevented by ensuring chemicals are not added directly to water bodies whilst facilities are in use.

All chemicals must be added prior to or post filtration.

Towels and bathing costumes pick up a variety of microorganisms and other contaminants when used by patrons. Some facilities operate hire services, resulting in towels and bathers being used by a number of patrons. This practice can result in infectious microorganisms being transferred between patrons. An approved process of cleaning must be implemented to prevent incidences of cross infection that can result from this practice.

9.2 Cleaning And Maintenance Requirements

All parts of an aquatic facility shall be maintained in good repair, in a sound working condition, and in compliance with the structural requirements of these guidelines. All parts of an aquatic facility, including sanitary and ablutionary facilities shall be maintained in a clean and sanitary condition, free of litter and vermin, to prevent the transmission of infectious disease. These requirements apply to all parts of an aquatic facility including associated plant, fixtures and equipment.

9.3 Hand Dosing Of Chemicals

Hand dosing or the introduction of chemicals directly into the water body shall not occur when the water body is occupied by patrons/ bathers.

9.4 Water Contamination

Aquatic facility water shall be maintained free of floating scum or debris.

Persons shall not:

- enter an aquatic facility water body, if wearing unclean clothes or unclean bathing costumes
- intentionally release bodily material into the water, other than such material released through the ordinary course of being in the water
- intentionally deposit any substance or article into the water that is likely to pollute the water or make it unfit for swimming.

Aquatic facility operators should encourage patrons to shower before entering aquatic facility water bodies.

9.5 Prohibition of Animals

Aquatic facility occupiers shall ensure animals are not permitted to enter an aquatic facility. Guide dogs are excluded from this provision, provided that they are not permitted to enter aquatic facility water bodies.

9.6 Prohibition of Entry

A person who:

- is suffering from any skin infection or other communicable disease; or
- who is in an unclean condition; or
- under the influence of drugs or alcohol; or
- toddlers who are not wearing an aqua-nappy

shall not enter or use, or attempt to enter or use, any swimming pool. This requirement does not apply to patrons who submit a current written statement, from a licensed medical practitioner confirming that the patron does not present a health hazard to other pool users.

9.7 Maximum Bather Numbers

Aquatic facilities shall ensure that the number of patrons in an aquatic facility water body does not exceed the following levels as detailed in the table overleaf.

Table 8: Maximum Bather Numbers

Type of Facility	Maximum Bather Numbers at any time (persons / m ² of water)
Spa pool, small temporary pool, bubble pool	1 person / 1.0 m ²
Toddler pool, waterslide splash down pool, wading pool, hydrotherapy pool	1 person / 2.0m ²
Learn to swim pool, wave pool, lazy river, school pool, health club pool, strata titled pool, caravan park pools, motel and hotel pools,	1 person / 2.5m ²
50m competition pool, diving pool, water polo pool	1 person / 3.5m ²

9.8 Towel And Bathing Costume Hire

The loan/hire of bathing costumes and/or towels is subject to an approved process of cleaning, between each hire or loan to the public.

9.9 Faecal And Other Body Fluid Accidents

All facilities are to have a suitable policy for disinfection following faecal and/or other body fluid accidents. All accidents must be recorded with all actions taken to affectively clean the effected area documented. Workers involved in the clean up must use personal protective equipment and avoid direct contact with faecal / body fluid.

Refer to Appendix 6 for further guidance on appropriate measures for disinfection following this type of incident.

10. Special Requirements for Small Temporary Pools

10.1 Cleaning the Pool

Leaves and other debris should be cleared from the pool, and all surface dirt hosed away on a daily basis. The internal surfaces of the pool should be scrubbed with disinfectant using a stiff broom kept specifically for the purpose. Any residual disinfectant should be rinsed away, to avoid interaction with the chlorine solution, before filling.

10.2 Filling the Pool

The pool should be filled from the domestic water supply. Chlorination chemicals should be added during the filling procedure to achieve a chlorine level of 4.0mg/l (0.004%), which should be maintained while the wading pool is in use. These chemicals are available in liquid and powder formulations, which release various levels of chlorine:

- Sodium hypochlorite (liquid): 12% available chlorine
- Bleaching powder: 20% available chlorine
- Calcium hypochlorite (powder): 65% available chlorine.

The chemicals should be thoroughly mixed with water in a clean container before pouring into the partly filled wading pool during the filling process. Alternatively manual stirring can be used to mix the solution with the pool water before children enter the pool.

An appropriate amount of chemical to be added can be obtained from the formula:

$$\frac{\text{required chlorine level (\%)}}{\text{level of available chlorine (\%)}} \times \text{volume of pool = the amount of chemical required}$$

(litres) (litres or kg)

$$1000\text{ml} = 1\text{litre}$$

$$1000\text{mg} = 1\text{kilogram}$$

mg/l = milligrams (of chlorine) in each litre (of water)

Table 9 provides a guide to estimating the amount of chlorination chemical required for a range of pool volumes:

Table 9: Amount of chlorine required

Pool volume (litres)	Sodium hypochlorite (liquid containing 12% available chlorine)	Bleaching powder (powder containing 20% available chlorine)	Calcium hypochlorite (powder containing 65% available chlorine)
4000	133 ml	80 gm	25 gm
4500	150 ml	90 gm	28 gm
5000	167 ml	100 gm	31 gm
5500	183 ml	110 gm	34 gm
6000	200.1 ml	120 gm	37 gm
6500	217.1 ml	130 gm	40 gm
7000	233.1 ml	140 gm	43 gm

10.3 Testing the Water

The chlorine levels should be tested using a test kit, which are available from swimming pool shops, before use. Exact chemical usage for your pool depends on a range of factors so test results are necessary to ensure safe levels of chlorine are maintained. The dose may need to be varied according to shade, weather and seasonal conditions as temperature and sun affect the rate of breakdown of chlorine in the water.

Simple records of chlorine levels, amount and type of chemical used and numbers of children should be kept to ensure the maintenance of safe water quality and economical operation.

The person supervising the pool should ensure regular testing. The recommended timing is hourly for continuous use or before each new group of children enters the pool.

Refer to Section 8 of these guidelines for suitable chemical parameters.

10.4 Using the Pool

Children with diarrhoea, upset stomachs, open sores or nasal infections should not be allowed to use the pool.

All children should use the toilet before entering the pool. Special care should be taken to ensure that they are trained in and are applying healthy toilet hygiene practices.

All children should wear clean bathers or a change of underwear in the pool.

Should any child defecate whilst in the pool all children should be immediately removed from the pool.

The pool should then be emptied and thoroughly cleaned and disinfected following the procedure outlined in Appendix 6 of these guidelines.

10.5 Reuse of the Pool

When the pool is filled in the morning and reused in the afternoon, the chlorine levels should be checked before the afternoon use. Where the chlorine levels are low additional chemical should be diluted, added and thoroughly mixed in the water before children enter the pool. If at any time the wading pool water appears dirty, the pool should be emptied and the water replaced and re-chlorinated.

10.6 After Use

Empty the pool at the end of the session or day. Secure filling and emptying valves or hoses against improper use.

Wading pools should be kept empty when not in use to minimise the risk to children and to prevent the water from becoming a source for mosquito breeding.

10.7 Materials Safety and Storage of Equipment

All the recommended chemicals are dangerous, and should be kept in lockable storage and always used according to the instructions on the labels. Refer to Section 4 of these guidelines for further information regarding chemical storage. Hoses used to fill the pool should be stored empty in a shaded area to avoid excessive build-up of micro-organisms.

Appendix 1: Recommended Safety Signage for Aquatic Facilities

It is recommended that safety signage contains the following statements.

Public Swimming Pools General Safety Requirements

- For accidents and emergencies contact – (emergency contact number).
- Children under the age of 10 years of age must be supervised by a competent person 16 years of age or older at all times.
- A statement specifying when the swimming pool is open.
- People with communicable/ infectious diseases including gastrointestinal illnesses such as cryptosporidiosis and skin infections shall not use the swimming pool.
- Do not use this pool for at least two weeks if you have had diarrhoea in the past week.
- Immunosuppressed individuals should not use the swimming pool.
- No dive-bombing, running or rough play in or around the pool.
- Large objects may obscure vision of the pool. Please remove them when not in use.
- Children should use the toilet before entering the pool.
- Before entering the pool, use the toilet and then shower (using soap).
- All swimmers should wear a swimming costume and non-toilet trained children should wear waterproof tight-fitting pants over swimmers.
- Children who are not toilet trained should use the wading pool.
- Avoid swallowing or putting pool water in your mouth.
- Animals not permitted in or around the pool.
- Do not use soap, detergent or any other substance in the pool.
- Do not climb up, or onto any fence or partition of roof within the pool area.
- People wearing contact lenses should remove them before entering the pool.

Heated Spa Pools (Taken From As 2610.1; 1993 – Public Spa Pools)

- This spa is a heated water environment and if you are concerned that it may adversely affect you it is your responsibility to seek medical advice.
- Do not put your head under the water.
- Do not swallow spa water.
- Do not use the spa area while under the influence of drugs or alcohol (certain medications may produce adverse effects).
- Do not use the spa alone.
- Do not use the spa for longer than 15 minutes at a time.
- Do not use the spa if you have an open wound, feel unwell or are pregnant.
- Children shall be supervised in the spa area.

Waterslides

- Each rider is to immediately leave the waterslide pool on discharge from the flume.
- Tandem riding is only permitted for adults who are accompanying small children on the waterslide.
- No person is to cause, suffer or permit rough behaviour or harassment of other persons in the waterslide pool, on the flume, walkways or platforms.
- Glass bottles, other articles containing glass and sharp objects are not to be carried or used within the flume, waterslide pool and its surrounds or the walkways.
- Waterslide riders are not to wear any personal effects such as jewellery, watches or spectacles, which are likely to result in personal injury to the rider, other riders or cause damage to the waterslide.
- Persons are not to use the waterslide in a manner, which will cause bodily injury to other slide riders.
- Persons under the influence of alcohol or drugs are not permitted to use the waterslide.
- Do not ride this waterslide unless your physical health is sound.
- Health authorities warn that it is considered unsafe to use a waterslide:
 - if you are pregnant
 - for persons with limb or back weakness/disability
 - for persons with heart ailments
 - for persons with any condition which could predispose them to further aggravation of their pre-existing condition or injury.
- Management reserves the right to refuse entry to any person at all times, i.e. where the person is under the influence of alcohol, drugs or for any other reason considered to create a potential hazard for that rider or other persons.

Non compliance with these rules would result in the rider being directed to leave the premises.

Appendix 2: Requirements for Ozone Water Treatment Systems

General Requirements

Ozone generating equipment shall only be used in conjunction with a free halogen residual, which shall be maintained in the water at all times.

The ozone concentration in the aquatic facility water body shall not exceed 0.1 milligrams per litre.

The operation and maintenance of the ozone generating equipment shall be detailed in the premises' operations manual.

All employees involved in the operation of ozone generating equipment shall be trained in the operation and maintenance of the equipment. Refresher training of ozone equipment operation and maintenance procedures shall be conducted a minimum of once every six months.

Design Requirements

Ozone generating equipment shall incorporate an approved ozone removal system such as granular activated carbon or thermal decomposition – to reduce the concentration of ozone in the water below 0.1 milligrams per litre, prior to it re-entering the water body.

The water shall be monitored with an ORP meter – which has the capacity to shut-off the ozonator if the oxidation reduction potential (ORP) reading exceeds 900 millivolts.

The ORP system shall have an operational range of 650 millivolts to 900 millivolts.

The ozone generation system shall be provided with an airflow metre and a device to control the airflow.

The ozone injection system shall operate on a vacuum principle, so that a loss of water flow will interrupt the injection of ozone into the water.

A check valve shall be installed between the ozone generator and the injection point.

The ozone injection point shall be located in the return line after the filtration and heating equipment, prior to the disinfectant injection point. The injection point shall be a minimum of 3 metres from the nearest return inlet.

Ozone mixes, diffusers, or contact chambers shall provide efficient mixing of ozone with the recirculation water.

Requirements for Ozone Plant Rooms

The plant room exit doors shall open outwards.

A ventilation system shall be provided, capable of achieving a minimum of three air changes per hour and have a separate automatic emergency ventilation system, with the capacity to provide a minimum of 30 air changes per hour.

Clearly labelled on/off switches shall be located directly outside the plant room which indicate and control the following:

- Emergency ventilation systems
- Lighting
- Ozone generator.

An audible and visual ozone detection and alarm system shall be located in the room containing the ozone generation equipment that complies with the following requirements:

- The alarm system shall consist of an audible alarm, that is capable of producing at least 85 decibels, and visual alarm consisting of a flashing light, mounted in plain view of the entrance to the ozone equipment room.
- The ozone sensor shall be located at a height of 1.5 metres above floor level and be capable of measuring ozone in the range of 0.0125 parts per million.
- The system shall activate when the ozone concentration reaches 0.1 ppm in the plant room.
- Activation of the alarm system shall shut off the ozone generating equipment and turn on the emergency ventilation system.

A sign shall be posted on the exterior of the entry door, stating "DANGER GASEOUS OXIDISER – OZONE" in lettering not less than 100mm high.

The ozone equipment room shall not be used for storage of chemicals, solvents or any combustible materials other than those required for the operation of the recirculation and ozone generating equipment.

Appendix 3: Requirements for Aquatic Solar Water Heating Systems

Construction Materials

Materials used to construct the system shall not contaminate water or be susceptible to corrosion under normal service conditions.

Temperature Control System

A temperature control system shall be installed.

The temperature control system shall ensure pool users will not be exposed to water temperatures exceeding 38°C.

Thermostats used for this purpose shall be of a type that cannot be adjusted without the use of tools.

Water Pumping System

Solar pool heating systems shall be installed on a plumbing circuit that is separate and independent from the filtration system.

A filter or strainer shall be installed to remove solids and/or debris and shall be located upstream of the pump.

Suction Outlets

Suction outlets shall be installed in the wall of the pool at least 500 mm above the floor level.

Drainage System

An automatic or manual drainage system shall be installed, to enable all water to be emptied from system when not in use.

The drainage system shall incorporate a back-flow prevention valve – to prevent water draining back to the pool through the filter.

Appendix 4: Water Balancing

Introduction

Section 8.2 of these guidelines recommends that aquatic facility water be correctly balanced.

The concept of water balancing is important, as correctly balanced water will prolong the life of aquatic facility water bodies and their fittings, assist in preventing staining and improve bather comfort.

Unbalanced water can produce a range of problems. These include etching or eroding of water body surfaces and fittings, or alternatively the formation of calcium salt precipitates, also known as scale.

Water Balance Factors

Water balancing ensures that the water in an aquatic facility contains the correct level of dissolved calcium. The correct level of calcium for a given facility depends upon the level of other materials in the water. Therefore there is no optimum level of calcium that can be universally applied to all facilities.

The three major factors that affect water balance are calcium hardness, pH and total alkalinity. Temperature also affects the water balance, but to a lesser extent.

The calcium hardness is a measure of the amount of calcium salts present in the water, expressed in milligrams per litre.

The pH is a measure of the relative acid / alkali content of the water. It is measured on a scale from 1 to 14, with 7.0 being neutral. Acid solutions have a pH less than 7.0 whilst alkali solutions have a pH greater than 7.0.

Total Alkalinity is a measure of the amount of alkaline salts present in the water, also expressed in milligrams per litre. These salts act to keep the water slightly alkaline, and reduce pH fluctuations when acids are added to the water.

The Effect of Calcium Solubility

Calcium is different to many other materials, as its solubility decreases at higher water temperatures. Calcium solubility also decreases at higher pH and total alkalinity levels.

In general, lower calcium hardness levels are required at higher pH, higher total alkalinity and higher water temperature levels.

Calculating the Water Balance

The water balance can be calculated using a number of tables or indexes. The following method is known as the Langlier Saturation Index ("SI").

The formula for the Saturation Index is:

$$SI = pH + TF + AF + CF - 12.1$$

Where: TF = Temperature Factor AF = Alkalinity Factor CF = Calcium Factor

The previous three factors are obtained by reading off the values from the following table.

Table 10: Saturation Index Factors

Temp (°C)	TF	Total Alkalinity	AF	Calcium Hardness	CF
0	0	5	0.7	5	0.3
3	0.1	25	1.4	25	1.0
8	0.2	50	1.7	50	1.3
12	0.3	75	1.9	75	1.5
16	0.4	100	2.0	100	1.6
19	0.5	150	2.2	150	1.8
24	0.6	200	2.3	200	1.9
29	0.7	300	2.5	300	2.1
34	0.8	400	2.6	400	2.3
41	0.9	800	2.9	800	2.5
51	1.0	1000	3.0	1000	2.6

Example

Consider a pool with the following water chemistry levels:
 pH: 7.7 Temperature: 29°C Alkalinity: 100 mg/L

Calcium Hardness: 200 mg/L

Using Table 10, the following values would be obtained:
 Temperature Factor: 0.7 Alkalinity Factor: 2.0

Calcium Hardness: 1.9

The saturation index is calculated as:

$$\begin{aligned}
 \text{SI} &= \text{pH} + \text{TF} + \text{AF} + \text{CF} - 12.1 \\
 &= 7.7 + 0.7 + 2.0 + 1.9 - 12.1 \\
 &= 0.2
 \end{aligned}$$

Interpreting the SI Value

The SI value should be maintained between -0.5 and 0.5.

When the SI value is less than -0.5, the water contains insufficient calcium, in relation to the levels of other materials. This may produce corrosion or etching of the facility.

When the SI value is more than 0.5, the water contains excess calcium, in relation to the levels of other materials. This may produce calcium deposits or scaling of the facility.

Adjusting Water Balance Values

The water balance may be adjusted by altering any of the four variables in the above equation.

However as the water temperature is often dictated by patron requirements, it is not generally altered to achieve balanced water.

The desired SI value is achieved by adjusting one or more of the pH, alkalinity or calcium hardness values. These parameters may be adjusted using the following methods.

pH

Adding acids to the water either in dry form (sodium bisulphate) or liquid form (hydrochloric / sulphuric acid) decreases the pH. These materials also decrease the total alkalinity.

Carbon dioxide gas can also be used to decrease the pH, but is a much weaker acid than the above two materials.

Adding alkalis such as sodium bicarbonate or sodium carbonate increases the pH. Sodium carbonate is a much stronger alkali than sodium bicarbonate, and should be used carefully.

Total Alkalinity

The Total Alkalinity is generally increased by adding sodium bicarbonate to the water.

Adding acids (as previously outlined) decreases the Total Alkalinity.

Calcium Hardness

Calcium hardness is increased by adding calcium chloride to the water. Using calcium-based chlorine disinfectants such as calcium hypochlorite also adds calcium to the water.

The only practical way of lowering calcium hardness is to dilute the material by adding fresh (top up) water containing a lower level of calcium. Facilities using calcium based chlorine disinfectants that experience excessive calcium hardness levels can also switch to using non-calcium based disinfectants.

Appendix 5: Minimising the Risk of *Cryptosporidium* Contamination in Public Swimming and Spa Pools

Introduction

Cryptosporidium parvum is the parasite responsible for cryptosporidiosis, a diarrhoeal illness in humans, but it can also occur in a variety of animals such as cattle and sheep. In an infected person, the parasite invades and multiplies in the gastro-intestinal tract, causing illness and producing oocysts, the infective form of the parasite. Oocysts pass out in the faeces to the environment where they can survive for a long time, including in water. As oocysts are resistant to standard levels of chemicals, such as chlorine and bromine used for pool disinfection, *Cryptosporidium* transmission in public swimming pools and spas is a real public health risk.

Cryptosporidiosis transmission is faecal-oral, including person to person, animal to person, waterborne and foodborne transmission. Animal droppings and human faeces containing oocysts contaminate hands because of poor hygiene practices, but oocysts are also deposited in soil, water and food.

Outbreaks of cryptosporidiosis have been reported around the world. Contaminated public swimming pools and recreational water facilities have also been related to several cryptosporidiosis outbreaks worldwide, including in Australia with reports of such outbreaks in 1998 in NSW, ACT and Queensland. These outbreaks highlight the need for public education about cryptosporidiosis and the development of appropriate pool risk management procedures with respect to *Cryptosporidium*.

Risk Management

The risk of a pool contaminated with *Cryptosporidium* is directly related to the organism's characteristics, its transmission and the epidemiology of disease. Briefly, infective oocysts are resistant to standard levels of chemicals used in pool disinfection and may not be adequately removed by the pool filtration system because of their small size. The more likely source of *Cryptosporidium* contamination in pools and spas comes directly from infected faecal material excreted by swimmers rather than from a water supply initially contaminated with *Cryptosporidium*.

To reduce the risk of *Cryptosporidium* entering a pool it is recommended that operators prepare strategies to prevent the introduction of *Cryptosporidium* into pools and institute measures to ensure the elimination of *Cryptosporidium* if introduced into the pool/spa.

Risk assessment applied to the contamination of pools and spas by *Cryptosporidium* identifies four key risk management areas:

- Swimmer hygiene practices
- Education
- Operational control and maintenance.

Swimmer Hygiene Practices

The single most effective method to prevent the transmission of *Cryptosporidium* in swimming pools is to stop oocysts from entering the pools by improving swimmer practices.

There are two priority areas: personal hygiene and non toilet-trained infants.

(a) Personal Hygiene

People who have had diarrhoea within the previous week should be advised not to swim in a public swimming or spa pool.

All patrons should be encouraged to:

- Use the toilet if necessary
- Shower thoroughly with soap and rinse well before entering the pool
- If it is necessary to visit the toilet to defecate, re-shower before entering the pool
- Pool water should not be drunk intentionally, nor should it be used for hand washing
- Swimmers should avoid deliberately putting pool water in their mouths.

In order to promote good personal hygiene practice, pool operators should install soap dispensers next to the showers and hand basins as well as installing hand-dryers or disposable hand towels dispensers. Nappy changing facilities and bins for soiled nappies should be provided in the change rooms.

(b) Non-Toilet Trained Infants

- The pool attendant should be notified immediately of any faecal accident.
- Non-toilet trained children should have their water activities restricted to the wading/toddler pool if possible.
- No children should be allowed to enter the water naked.
- Non-toilet trained infants should wear swimmers with waterproof tight fitting pants over them.
- Under no circumstances should nappies be worn while swimming.
- Nappies should be changed in change rooms and not at the poolside. The child should be washed thoroughly and the changer should wash their hands immediately afterward.
- Soiled nappies should be disposed of in the bins provided.
- Non-toilet trained children should be taken to the toilet frequently.

(ii) Education

Education of both the public and pool staff is essential in preventing the transmission of cryptosporidiosis and fulfils part of the pool management's "duty of care" to their patrons.

Because there is growing community awareness of *Cryptosporidium* it is important to reinforce this with information about proper personal hygiene. The local Environmental Health Office may be able to assist with educational material.

The following educational strategies are recommended as part of good pool management procedures:

- Ensure all pool staff are fully trained in pool/spa operational procedures.
- Ensure that all pool staff are empowered to act immediately on incidents and behaviour which may cause contamination (e.g. infants with unsuitable swimmers, or patrons who may present a risk such as those who are incontinent or indicate they have had a diarrhoeal illness).
- Ensure patrons are aware that management will reserve the right to prevent patrons from swimming if there is reason to believe that they may cause a risk to other swimmers.
- Provide public information about the risks of spreading cryptosporidiosis. Methods for providing information could include information on notice boards and pamphlets for those entering the pool.
- Provide suitable signs in the entry foyer and in amenities areas to promote showering (refer to Appendix 1 of these guidelines).

- Signs could also be placed behind toilet doors requesting customers to wash hands thoroughly and to shower after using the toilet.
- Display all results of water quality pool testing together with recommended standards in a suitable public area for customer information and confidence.

When pools are being upgraded, consideration should be given to designing amenities so that all patrons have no choice but to walk through a shower area before gaining access to the pool. Because patrons tend to avoid cold showers, warm showers with temperature control devices to prevent scalding would be preferable.

(iii) Operational Control and Management

These are the practices and procedures that management and staff should follow to ensure optimal swimming pool and spa pool water quality at all times. Additional strategies and policies on pool management should be developed to suit individual pools and these should be consistent with the operational procedures in these guidelines.

The following should specifically be considered:

- Circulation and filter systems should be maintained to provide maximum filtration efficiency and run 24 hours a day.
- Pool water disinfectant levels should be maintained in anticipation of swimmer numbers such that disinfectant concentrations always remain above the minimum recommended levels specified in Section 5 of these guidelines.
- Pool water should be superchlorinated overnight at least fortnightly and where possible weekly (refer to the Section 5.9 of these guidelines).
- All pools should be regularly water suctioned.
- Regularly test pool water quality on-site (Section 8.5 of these guidelines) and submit quarterly bacteriological samples to a National Association of Testing Authority (NATA) accredited laboratory for bacteriological testing (see Section 8.7 of these guidelines).

Bacteriological testing does not include testing for *Cryptosporidium*; however, the presence of thermotolerant coliforms is an indicator of possible faecal contamination. Note that Cryptosporidia have been known to occur in the absence of bacterial indicators. All test details should be logged as recommended in Section 8.7 of these guidelines.

Faecal Contamination accidents

- If faecal or vomiting accidents occur follow the emergency decontamination procedures contained in Appendix 6 of these guidelines.
- Any wastes from suctioning faecal matter from the pool should be discharged into the sewer and neither into the pool filtration system nor the stormwater system.
- Log details of all known faecal incidents and corrective actions taken.

Wading or toddler pools are best served by their own pool water circulation system. Where separate circulation systems are used avoid cross contamination and do not feed bulk water from one system to the other through balance tanks. If pools are not on separate systems consideration should be given to separating pool circulation systems when upgraded.

Appendix 6: Faecal and Other Body Fluid Accident Policy

It is recommended that the following procedures are adopted following faecal and/or other body fluid contamination of the pool or surrounding area.

Contamination of Pool with Solid Stools

- All pool users in the immediate area should be asked to exit the pool.
- As much faecal material should be immediately removed from the pool with a fine mesh scoop. If necessary, the immediate area should be vacuumed with waste being directed to sewer or other approved waste disposal system. (Vacuum equipment should be cleaned and disinfected before reuse to prevent re-contamination).
- Spot chlorinate the affected area. This can be achieved by adding one litre of sodium hypochlorite or one cup of calcium hypochlorite to the affected vicinity.
- An arc of contamination extending from the point of the incident to the nearest wet deck, skimmer boxes or scum gutters should be roped off and closed for public use until the pool is reopened.
- If the pool is a low volume pool, such as a toddler or wading pool, consideration should be given to closing and draining the pool. Spa pools should be closed and drained as the faecal matter will have dispersed. A low volume pool can be re-opened when it is re-filled with water and the chemical parameters are satisfactory.
- Check that pool chlorine levels overall are within regulatory chemical parameters. Where the chlorine concentration is satisfactory, allow the pool to be reopened. Where the chlorine concentration is low and the water is outside the chemical parameters contained with Section 4 of these guidelines, the pool should be closed for one pool turnover. Chlorine and/or other chemicals should be added to achieve regulatory chemical parameters.
- Once the regulatory chemical parameters are satisfactory and confirmed through testing, the affected area may be opened to the public.

Contamination of Pool with Runny Stools

- All pool users in the immediate area should be asked to exit the pool.
- A coagulant should be added on and around the stool. The faecal material should be immediately removed from the pool with a fine mesh scoop.
- Spot chlorinate the affected area. This can be achieved by adding one litre of sodium hypochlorite or one cup of calcium hypochlorite to the affected vicinity. Where practicable, also add a coagulant to the filter media. The immediate area should be vacuumed with waste being directed to sewer or other approved waste disposal system. (Vacuum equipment should be cleaned and disinfected before reuse to prevent re-contamination).
- An arc of contamination extending from the point of the incident to the nearest wet deck, skimmer boxes or scum gutters should be roped off and closed for public use until the pool is reopened.
- If the pool is a low volume pool, consideration should be given to closing, draining and cleaning the pool. Spa pools should be closed, drained and cleaned. A low volume pool can be re-opened when it is re-filled with water and the chemical parameters meet the standards contained with Section 7 of these guidelines.
- Check that pool chlorine levels overall are within regulatory chemical parameters.
- Where the chlorine concentration is satisfactory, allow the pool to be reopened.

- Where the chlorine concentration is low and the water is outside the chemical parameters the pool should be closed for one pool turnover.
- Chlorine and/or other chemicals should be added to achieve regulatory chemical parameters. Once the regulatory chemical parameters are satisfactory and confirmed through testing, the affected area may be opened to the public.
- Superchlorinate and backwash all filters that evening.

Contamination on the Equipment or Decking

- All pool users should be asked to leave the immediate area.
- As much faecal material should be immediately removed from the area and disposed into a sewer or approved waste disposal system.
- The area of contamination should be scrubbed and washed with low pressure water to the nearest floor drain. Care should be taken to avoid splashing water into the pool and to minimise the area of contamination.
- The contaminated area from the point of the incident to the floor drain should be treated with disinfectant (high strength chlorine or equivalent), roped off and closed for public use for at least 10 minutes before washing away.

Contamination by Blood, Vomit and Other Body Fluids

- The pool should be temporarily cleared and the contamination dispersed until there is no further trace. Tests for chlorine levels should be satisfactory before allowing people to swim.
- Blood and other body fluid spillage on the poolside should not be washed into pool side drains. It should be neutralised with a 1% chlorine solution (household bleach or a 10:1 dilution of sodium hypochlorite) for two minutes before being washed away.
- Ensure universal precautions are undertaken by all staff dealing with faecal matter, blood and other body fluids.

Faecal, Blood, Vomit or Other Body Fluid Contamination of a Small Temporary Pool

- All pool users should be all children should be immediately removed from the pool.
- The pool should then be emptied and as much faecal material should be removed from the area and disposed into a sewer or approved waste disposal system.
- The pool should be scrubbed and washed with low pressure water to the nearest drain. Care should be taken to minimise the area of contamination.
- The pool should be treated with disinfectant (high strength chlorine or equivalent), and left for at least 10 minutes before a final wash and refill of the pool.

All faecal and other body fluid accidents should be recorded and the action taken in the Log Book.