

**B.C. GUIDELINES FOR
POOL OPERATIONS
VERSION 2**

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**HEALTH PROTECTION BRANCH
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PREFACE

The B.C. Pool Regulation, B.C. Reg. 296/2010 (pursuant to the *Public Health Act*) replaces the Swimming Pool, Spray Pool and Wading Pool Regulation, B.C. Reg. 289/72, and the Pool Exemption Regulation, B.C. Reg. 256/98. The regulation came into effect on October 8, 2010 and was amended on August 8, 2012. The Pool Regulation modernizes the requirements for the design, construction, alterations to, and operation of swimming and bathing facilities offered for use by the public.

The new regulation is a shift from a prescriptive to an outcome-based regulation. *B.C. Guidelines for Pool Operations* is designed to help operators and regulators interpret the Pool Regulation with respect to the operation of pools. These guidelines represent generally accepted standards of safe practices.

Depending on the type of pool and the use that it is put to, higher standards may be required. Each pool owner is responsible for ensuring optimum water quality and pool safety. While the guidelines provide information on pool operations, they are not meant to be a substitute for a detailed pool operator's course.

In this document, "should" indicates a generally accepted standard, whereas "must" denotes a requirement of the Pool Regulation, B.C. Building Code, B.C. Plumbing Code, B.C. Electrical Code, or other applicable regulations. Where there is a discrepancy between any B.C. legislation and these guidelines, the legislation shall prevail. Where there is a discrepancy between the B.C. Pool Regulation and these guidelines, the Pool Regulation shall prevail.

The guidelines were developed with input from various stakeholders, including British Columbia's health authorities, BC Recreation and Parks Association, the Lifesaving Society, Canadian Institute of Public Health Inspectors, Architects Institute of British Columbia, WorkSafeBC and the Association of Professional Engineers and Geoscientists of British Columbia.

The operation guidelines may be reviewed and updated from time to time. Please visit the Ministry of Health's Recreational Water Quality website for updates:

http://www.health.gov.bc.ca/protect/ehp_recreational_water_quality.html.

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PART ONE: GENERAL OPERATION

1 OPERATING PERMIT

Reference Section of Pool Regulation: *Section 6*

All pools in British Columbia that fall under the Pool Regulation must have a valid operating permit issued by the health authority. The regulation requires that an operating permit be posted in a prominent place on the premises and that all requirements set out in the permit are complied with. An operating permit is not transferable – the permit is valid only for the pool for which it has been issued and is not valid with a change of pool ownership. It expires on the earlier date specified in the permit, if any, or one year following issuance of the permit.

For new or renovated pools, an application for an operating permit may be made upon completion of the construction/renovation of the pool. The application must include the following documentation:

1. A signed statement from an engineer or architect that the pool has been constructed so as to substantially comply, in all material respects, with the plans and specifications submitted in the application for construction permit. For a copy of this application refer to the *B.C. Guidelines for Pool Design* on the Ministry of Health's website at:
http://www.health.gov.bc.ca/protect/ehp_recreational_water_quality.html.
2. A copy of the completed pool data sheet. For a copy of the pool data sheet, refer to the *Pool Safety Plan Guide for Pool Operators* on the Ministry of Health's website at:
<http://www.health.gov.bc.ca/protect/pdf/pool-safety-plan.pdf>.
3. A copy of the pool safety plan for your pool prepared in accordance with Section 13 of the Pool Regulation. For information on pool safety plans, refer to Part 4: Pool Safety Plans in this document. To read the *Pool Safety Plan Guide for Pool Operators*, visit: <http://www.health.gov.bc.ca/protect/pdf/pool-safety-plan.pdf>.

The operating permit may state terms and conditions for the pool operation, such as maximum bather load, design flow rate and any other conditions required by the health authority. Contact your local health authority to apply for an operating permit or get more information on obtaining one.

Spray pools that use water from a water supply system as defined in the *Drinking Water Protection Act* – here the water drains and is not recirculated – do not require operating permits. These types of pools generally do not present a communicable disease risk. They will, however, continue to require construction permits to ensure safety hazards are managed through the design of physical features.

2 SPRAY POOLS

Reference Section of Pool Regulation: *Section 6*

Spray pools are to be operated and maintained in a safe and sanitary manner in order to reduce the risk of injury or illness to patrons. This includes the following:

- Discontinue use of the spray pool where there is contamination of the water, or a health or safety concern is identified that warrants closure. Your local health officer can be consulted to determine if closure is required.
- Wash down and rinse the spray pool pad as required in the pool safety plan.
- Drainage should be bypassed to waste when the pool is not in operation.

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- Undertake daily inspections of the spray pool to ensure adequate safety and sanitary conditions are being maintained. For example, ensure that:
 - Drains are not blocked.
 - There are no equipment deficiencies/hazards.
 - UV disinfection systems are turned off when the spray pool is not in use.
- Store chemicals so that they are only accessible by the operator or designate.
- Make sure water used in the spray pool is free of potential disease-causing organisms or harmful chemicals, either via the water's source or from the appropriate filtration and disinfection systems.
- Regularly check and maintain the filtration and disinfection systems to ensure they are operating in accordance with their design.
- Ensure there is no standing water on or near the spray pool. Maintain or replace equipment to prevent standing water.

3 SIGNAGE AND POOL RULES

Reference Section of Pool Regulation: *Section 8*

An operator must post a sign stating the rules of the pool. Signage must be placed in a prominent location within the pool enclosure, so that it is clearly visible to all pool patrons. The pool rules must prohibit:

- Entering the pool enclosure with an illness – including open sores, bandages, head colds, discharging ears and/or noses, and eye infections.
- Entering the pool enclosure without taking a cleansing shower first.
- Running, fighting or engaging in other conduct likely to cause an injury while in the pool enclosure.
- Contaminating or fouling the pool.
- Failing to immediately report an injury suffered while in the pool enclosure, or contamination or fouling of the pool, to the pool manager or lifeguard.
- Failing to supervise children less than seven years of age for whom one is responsible while in the pool enclosure.
- Diving into the pool, except in designated areas.

Signage must also be provided that indicates the:

- Location of the telephone for emergency use (mandatory for public pools).
- Emergency numbers for the nearest hospital, ambulance services, police and fire departments.
- “No lifeguard on duty” – in those circumstances where lifeguards are not required.

Pool operators may consider posting additional rules they deem appropriate for their facility. These may include, but are not limited to:

- Prohibiting glass in the pool area.
- Prohibiting people under the influence of intoxicants.
- Requiring clean and appropriate bathing attire as determined by pool management.
- Restricting the use of equipment in the interest of safety, where appropriate.
- Requiring that all children under seven years of age be closely supervised (within arm's reach at all times) by a responsible person of at least 16 years old.
- Keeping children less than seven years of age, and especially infants, out of hot tubs and spas.
- Requiring that no more than three children under seven years are supervised by one responsible person of at least 16 years of age at one time.

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- Prohibiting those with flu-like symptoms, including vomiting and diarrhea for up to 48 hours after cessation of such symptoms.
- Requiring infants and toddlers to wear swim diapers and/or elastic swim pants.
- Prohibiting drinking the water in recirculation spray pools.
- Prohibiting animals in or near the pool (except registered assistance dogs).
- For pools with slides, providing signage that indicates:
 - Only one rider at a time.
 - Wait until the landing area is clear before entering the slide.
 - Slide only in the sitting position or on the back.
 - Do not attempt to stop on the slide.
 - Leave the plunge area immediately.
 - Slide users must be of an age and size to manage the slide.

POOL RULES

Prominently posted pool rules help specify and educate patrons about appropriate behavior to ensure the health and safety of themselves and others using the facility.

Examples of typical rule signs for pools and hot tubs are included in Appendix A.

All signage must be where pool patrons can clearly see and read it, preferably as they enter the pool. It should be consistent in format and easily understandable, and include symbol signage wherever possible. Further consideration should be given to ensuring print on signs is easily read by those with impaired vision. Providing Braille signage on all doors or any important safety notices are important considerations. All signs should be in English, but can also be in a second language common to the location.

4 BATHER LOAD

The maximum permitted bather load of the pool is stated on a pool's operating permit or pool data sheet. The maximum bather load should be posted in prominent place. Pools are designed with a maximum number of bathers in mind for health, safety and engineering reasons. Pool operators should ensure:

- Disinfectant has the capacity to treat water contaminated by all bathers.
- The capacity of the surge tank for the pool is not exceeded.
- Sufficient washroom and change room space is provided.
- Overcrowding does not lead to increased risk of injury.
- Swimmers in distress can be easily identified.

Maximum bather loads should be based on each individual pool in a facility, not the combined capacity of all pools in a facility. In most cases, this will be determined using the formula below. However, this may need to be further adjusted based on operational issues or other factors (e.g., washroom capacity).

The following formulas can be used to calculate maximum bathing load. Pool depths of less than 60 cm (2 ft) need not be considered in the calculations.

Imperial: Maximum Bathing Load = (D/27) + (S/10)

Where D = area of pool in sq ft where the water depth is greater than 5 ft, and
Where S = area of pool in sq ft where the water depth is less than 5 ft.

Metric: Maximum Bathing Load = (D/2.5) + (S/0.93)

Where D = area of pool in m² where the water depth is greater than 1.5 m, and
Where S = area of pool in m² where the water depth is less than 1.5 m.

Bathing load for hot tubs may be determined at a rate of 30 cm (1 ft) of seating per person.

5 CLEANLINESS

Reference Section of Pool Regulation: *Section 9*

As part of the pool safety plan (see Part 4), the Pool Regulation requires that there must be a written program for cleaning and maintaining the pool, including the nature and frequency of cleaning. This may include a posted schedule that can help organize the cleaning tasks. A cleaning schedule should also include the methods, equipment and cleaning products to be used for each task.

Quaternary ammonium cation cleaners/sanitizers should not be used for cleaning pool deck surfaces. They interact with the chlorine to produce disinfection byproducts such as chloramines – decreasing the disinfecting efficacy of the pool water and contributing to the chlorine smell associated with pools.

Pools must be kept clean and clear of obstructions, provide adequately equipped hand basins. Where services are offered, bathing suits and bath towels must be laundered after each use and stored/handled in a sanitary manner.

Pool water and the walls and bottom of the pool are to be kept free of visible dirt, litter, body oils and algae growth. Walkways, pool aprons, dressing rooms, shower rooms and toilets should be cleaned and sanitized at least daily, and kept free of all equipment and material not needed for the proper operation of the pool. Hand-washing facilities, with hot and cold running water, are to be adequately equipped and maintained with single-use towels or dryers and single-use soap in dispensers.

A CLEAN POOL

Promoting good personal hygiene helps maintain a sanitary, healthy pool environment. Dirty or unsanitary conditions can:

- Introduce unwanted bacteria, viruses, mould and algae into the pool environment.
- Reduce the effectiveness of chlorine or other disinfectants.
- Promote algae, mould or bacterial growth.

This can lead to:

- Slippery conditions due to algae and mould growth.
- Bacterial and fungal growth that can lead to infections and gastrointestinal outbreaks.
- Increased volume of pool chemicals required.
- Unpleasant odors.

6 WINTER HAZARDS

Outdoor pools operated in cold climates are subject to hazards such as ice formation on decks, steps and ladders. Waterslides may be subject to freezing of water in the slide, which may be sharp enough to seriously cut a person.

All pools operating in a location where there is a possibility of water freezing on the deck or edge of the pool must provide an effective method of heating the deck, access walkways and stairs to prevent the formation of ice and keep them ice free.

Consideration should be given to preventing the formation of ice on waterslides or other structures in the design. Pools that are shut down in winter require special design considerations and maintenance procedures to prevent damage to the pool during winter.

PART TWO: POOL WATER

1 POOL WATER PARAMETERS

Reference Section of Pool Regulation: *Section 10*

Maintaining pool water parameters within the acceptable ranges will help promote adequate disinfection and good water clarity, which are essential to patrons’ health and safety. Balanced pool chemistry also helps reduce corrosion and scaling of the pool infrastructure, which significantly lowers long-term maintenance costs. It is the responsibility of each pool operator to ensure optimum water quality and pool safety.

2 TESTING FREQUENCY

Reference Section of Pool Regulation: *Section 10(2)*

The regulation requires minimum testing frequencies for water chemistry parameters, listed in Table 1. However, many pools may benefit from more frequent testing.

TABLE 1: WATER PARAMETERS TESTING FREQUENCY

Water Parameters	Minimum Frequency in Regulation	Recommendation for Most Pools
free available chlorine	at least twice daily	every 4 hours*
combined chlorine	at least twice daily	at least twice daily
pH	at least twice daily	every 4 hours*
alkalinity	at least weekly	at least weekly
cyanuric acid**	at least weekly	at least weekly
calcium hardness***	at least weekly	at least weekly

* Or before and after periods of heavy use.

** For use only in outdoor pools.

*** Not specified in the Pool Regulation, but recommended.

Your local health officer will help you determine an appropriate testing frequency for your facility. Note that, in some instances, the health officer has discretion related to the **frequency of testing** for disinfectants and for combined chlorine where the appropriate public health outcomes can be achieved through alternate testing frequencies.

The minimum testing frequency stated in the regulation should be adequate for pools that see very little use; however, pools that experience heavier use will require much more frequent testing to ensure a proper chemical balance. Bather load, temperature, type of use and type of pool may cause a shift in chemical parameters throughout the day. Increased testing is warranted in the following cases:

- After chemicals are added to the pool because measurements can vary widely at this time.
- During periods of heavy use.

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- With the use of erosion feeders for adding disinfectant (as they dissolve, their ability to add chlorine decreases).

Once chemicals have been added to the pool water and have had sufficient time to dissolve and mix, the water is to be tested prior to allowing the public to re-enter the pool.

Critical parameters such as free chlorine and pH require frequent testing to verify they are within the acceptable range. Where testing reveals a deviation from the acceptable range, corrective action must be taken immediately to ensure disinfection effectiveness to prevent bacterial growth. Other parameters are generally not subject to as much variation throughout the day and do not require as frequent testing.

Where automated systems are used for testing, your health officer should be consulted regarding requirements for manual testing to supplement the automated testing.

3 CHEMICAL TESTING EQUIPMENT

Suitable testing equipment is to be provided for the reliable determination of disinfectant residuals, hydrogen ion concentration (pH), total alkalinity, calcium hardness, and cyanuric acid. Other parameters that are frequently tested include total dissolved solids, and oxidation-reduction potential (ORP).

More information on ORP can be found in section 5.10.3.

Testing equipment must be kept onsite. Test kits are to be maintained and replaced in accordance with the manufacturer's recommendations. In many cases this will entail replacing reagents every year.

Pool operators and/or pool staff need to be trained in the proper use of test kits and know how to respond to a specific reading – and/or to whom they should report the reading for a response (e.g., supervisor or pool-maintenance company).

Tests need to be conducted in accordance with the test kit manufacturer's instructions and recommendations. They should be undertaken by individuals trained to do the testing and who know how to respond to a specific reading. Testing equipment needs proper maintenance. Similarly, chemical controllers should be maintained and calibrated according to the manufacturer's recommendations.

Where monopersulfate is used to shock pool water, it can interfere with test kits and cause false chlorine readings. If these types of products are used, measurements should be undertaken using a test kit with specific reagents that eliminate the interference.

Chemical test strips should only be used as a preliminary screening tool or to augment routine monitoring with a reagent test kit, but they should not be used as a sole monitoring method.

Test kits that use the "DPD (diethyl-p-phenylene diamine) method" are recommended for testing free and combined chlorine. Test kits using the "OTO method" (orthotolidine) should not be used. OTO presents health hazard risks because it only indicates total chlorine and does not differentiate between free and combined chlorine.

ACCURATE TEST RESULTS

Accurate test results allow operators to verify that the pool chemistry is in balance – or take corrective action when necessary to ensure effective disinfection, and reduce corrosion and scaling. To get accurate results, appropriate equipment must be used, and the manufacturer's instructions followed.

4 RECORDS

Reference Section of Pool Regulation: *Section 19*

Operators must ensure a daily record is kept for each pool. The record must be available onsite for inspection by the health officer upon request. Records must include:

- All complaints and injuries sustained at or within the pool.
- All occurrences of fecal and vomit contamination at or within the pool.
- The amount and types of chemicals added to the pool water.
- Results of pool water tests performed under the Pool Regulation or as required by the health officer.

Records are to be retained related to the maintenance of mechanical equipment. All records are to:

- Be accurate.
- Be clear and legible, recorded in ink.
- Indicate the date and time the test or corrective action was taken.
- Include the name of the individual conducting the test and making the entry.
- Be readily available for review on request of the health officer.

A sample pool and hot tub testing and maintenance log is in Appendix B, which may be copied and adopted.

Good record-keeping helps develop a historic record that can be used to resolve problems, track chemical use, troubleshoot unexpected results and respond to adverse events. For example, it is very helpful to know the exact amounts of chemical required to affect a particular amount of change in pool chemistry.

5 WATER QUALITY PARAMETERS

5.1 WATER CLARITY

Reference Section of Pool Regulation: *Section 10(2)(a)*

The regulation requires that water be clear enough that the pattern of the main drain or a black disc of 150 mm in diameter over a white background, located at the deepest point of the pool, can be clearly seen by a person standing on the edge of pool overlooking the main drain or disc. This criterion is a practical test for pool clarity that can be easily done when the pool is in use. Whenever the main drain of the pool is not visible, the operator must close the pool immediately and re-open it only when the visibility is acceptable.

Clear water is not only aesthetically pleasing; it also allows lifeguards and patrons to see swimmers in difficulty under water. As well, it reduces the chance of injury from colliding with an unseen object or person, and allows people to see potential hazards in the pool (e.g., broken glass). Cloudy or turbid pool water may also adversely affect the effectiveness of disinfectants in the pool water or indicate other problems with pool chemistry.

5.2 WATER TEMPERATURE

Reference Section of Pool Regulation: *Section 10(2)(b) and 16(b)*

The regulation requires that the temperature of pool water must not exceed 37°C, except for a hot tub, which must not exceed 40°C. It is recommended that pools used solely for competitive swimming be maintained at temperatures of 25°C to 28°C to avoid heat-stress-related incidents.

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Pools are used for many purposes, including competitive sport, laps and water aerobics, leisure and hot tubs. Ideal water temperatures for each of these activities vary considerably.

Competitive swimmers, lap swimmers and patrons engaging in other vigorous physical activity prefer cooler water temperatures to help regulate body temperature. Patrons of leisure pools, such as wave pools, infant and tot pools, and other pools where patrons are not engaged in rigorous physical activity may prefer higher temperatures.

Patrons of hot tubs are the least active of pool users and use the facility for shorter periods of time. The World Health Organization says high temperatures (above 40°C) in spas or hot tubs may cause drowsiness, which may lead to unconsciousness and, possibly, drowning.

The maximum allowable temperature for pools protects the public from heat stroke or other potential heat/exertion risks. The current maximum in the regulation is based on work done for the British Swimming Association on hypo- and hyperthermia, physical exertion and water temperature. It indicates that a swimmer is unlikely to suffer heat stroke in water at 37°C. This suggests that facilities with leisure pools should be able to operate safely as high as this water temperature to meet their patrons' needs.

5.3 WATER MICROBIOLOGY

Reference Section of Pool Regulation: *Section 10(2)(c)*

The microbiological quality of water must not be a health risk for pool patrons.

When water samples are taken directly by pool operators, a copy of all results should be forwarded to the local health authority. Adverse microbiological testing results will often mean immediate corrective action is needed as required by the health authority.

Your local health authority will assist in deciding on a routine sampling schedule, sampling regime, and planning response to adverse results. This information may be required as part of the conditions on an operating permit.

In instances where a boil-water advisory is in place, contact your health authority for guidance on water quality and use in pool situations.

Many considerations are taken into account when determining a microbiological sampling regime, for example:

- How often you should take samples?
- How many samples should be taken at a time?
- From where should the samples be taken?
- What labs should analyze your samples?
- What tests should be done?
 - coliform
 - fecal coliform
 - *Pseudomonas*
 - *E. coli*
- How should samples be transported to the lab?

Routine testing of water for bacteriological quality can provide evidence of the effectiveness of disinfection systems and sanitation schedules. Pool water found to have poor microbiological quality could indicate there is a problem with the disinfection and recirculation system. It could also indicate a health risk to your patrons.

5.4 pH AND ALKALINITY

Reference Section of Pool Regulation: *Section 10(2)(d)and(e)*

The pH of water must be tested at least twice daily, and maintained at no less than 7.2 and no more than 7.8.

The pH is a measure of how acidic or basic the water is, and is a critical parameter in pool chemistry. Maintaining pH within the required range of the regulation has a number of benefits:

- Chlorine disinfectants are most effective when the pH falls within a limited range (7.2 to 7.6 is optimal).
- It reduces eye and skin irritation.
- It reduces scale formation and corrosion.

Pool water pH is affected by many parameters, including activities in the pool, type of chemicals used and the addition of chemicals. These factors can cause spikes or drops in the pH, particularly in smaller pools.

Alkalinity is a measure of carbonate and bicarbonate on the water. The alkalinity of water must be tested at least weekly to ensure it is maintained in the range of 80-120 ppm to help the pool water resist rapid changes in pH.

In some instances, the health officer has discretion to set requirements for both pH and alkalinity that are more stringent than, or alternative to, those specified above, where the appropriate public health outcomes can be achieved through alternative testing frequencies.

5.5 CHLORINE DISINFECTANT

Reference Section of Pool Regulation: *Section 10(2)(f)*

Chlorine disinfectants used in the pool water must be tested at least twice daily and maintained at the minimum concentrations listed in Table 2. Concentrations should not, however, exceed 5.0 ppm, as this may result in eye, nose, and skin discomfort.

TABLE 2: REQUIRED MINIMUM CONCENTRATION OF CHLORINE

Disinfectant	≤30°C	>30°C
free available chlorine	0.5 ppm	1.5 ppm
chlorine cyanurate	1.0 ppm	2.0 ppm

Note: It is advisable to keep concentrations in the pool 0.5 ppm above the minimum listed in Table 2 to allow for a drop in response to increased use.

Combined available chlorine should be kept as low as possible and must not exceed 1 ppm.

Chlorine pucks are **not** to be used in skimmers as this is not an acceptable means to chlorinate pools. They can present an immediate chemical hazard to bathers and are an ineffective method of chlorination due to their inability to quickly respond to fluctuating chlorine demands.

Chlorine is the most widely used disinfectant in regulated pools in B.C. Generally, it is added to pool water by adding chlorine gas, or hypochlorites in liquid or solid form. These are powerful oxidizers that, when used properly, can control viruses and bacteria in pool water.

The complexities of chlorine chemistry can be simplified to what can be measured by a basic test kit:

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- Free available chlorine (FAC) is the portion of the chlorine in the water that does most of the disinfecting and oxidizing.
- Combined available chlorine (CAC) is that which has reacted with organic compounds and remains in pool water.
- Total available chlorine (TAC) is the sum of free available chlorine plus the combined available chlorine according to the formula $TAC = FAC + CAC$.

As most test kits test only for total and free available chlorine, the combined available chlorine can be determined by rearranging the above formula to $TAC - FAC = CAC$.

There are many factors that affect the effectiveness of chlorine disinfection. High concentrations of organic matter (e.g., high bather load, sunscreen and tree leaves) can create a significant demand on disinfectants. This is especially true in smaller pools where it is advisable to keep disinfectants greater than the minimum concentration to allow for a drop in disinfection effectiveness to increased use.

Once free available chlorine reacts with organics to form combined available chlorine (CAC), it is much less effective at disinfection. CAC can cause objectionable odors, and may cause eye or respiratory irritation to patrons. To avoid these problems, CAC should be removed by superchlorination, oxidation or other means before it reaches the maximum level permitted in the regulation.

Higher water temperatures favor bacterial growth and require a higher concentration of disinfectant.

Operators of salt water systems or erosion feeders should have supplementary forms of chlorine (e.g., calcium hypochlorite, sodium hypochlorite, lithium hydrochlorite and dichloroisocyanurate) available to use in the event that a rapid increase in the chlorine concentration is necessary.

5.6 HOT TUBS

For hot tubs, it is recommended that disinfectant should be maintained in the range of 3.0 ppm – 5.0 ppm for free available chlorine or 5.0 ppm – 8.0 ppm for bromine.

Due to the potential for sudden increases in bather load, temperatures in excess of 37°C and relatively small volume water in hot tubs, higher levels of free chlorine help to ensure chlorine levels do not drop below acceptable levels. This is not as critical in hot tubs with automatic controllers, as they are able to respond more quickly to fluctuations in chlorine levels. The water temperature in hot tubs must not exceed 40°C.

Contact WorkSafeBC for information on safe practices for handling chlorine products.

5.7 CYANURIC ACID

Reference Section of Pool Regulation: *Section 10(2)(h)*

If cyanuric acid is used in pool water, the concentration must be tested at least weekly, and maintained at a concentration of less than 80 ppm. An increase in the amount of free chlorine concentration is also required (see section 5.5, above) when cyanuric acid is used in pool water.

A concentration of 30 ppm to 50 ppm is an ideal range when used in outdoor pools.

Cyanuric acid is a stabilizer that helps outdoor pool water resist loss of chlorine due to ultraviolet light from the sun. Some commercial chlorine pool disinfectants contain cyanuric acid or it can be added to a pool on its own.

Cyanuric acid should not be used in indoor pools. Since cyanuric acid is intended to reduce the loss of free

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chlorine caused by the sun's ultraviolet rays and indoor pools are not exposed to direct sunlight, there is no benefit in adding cyanuric acid to the pool water or using products containing cyanuric acid (e.g., trichlor or dichlor).

Continued addition of cyanuric acid to a pool can result in elevated concentrations. The effectiveness of chlorine as a disinfectant begins to decrease the more cyanuric acid there is in the pool. This can lead to algae and bacterial growth in the pool and on the deck. Once high concentrations of cyanuric acid have accumulated in pool water, they can only be reduced by draining a portion of the pool and diluting it with fresh water.

5.8 OZONE

Ozone, where used, must always be in combination with a residual disinfectant such as chlorine.

Ozone is an effective sanitizer and oxidizer of organic matter. Pools that use ozone in conjunction with chlorine in the circulation system can effectively reduce the amount of chlorine needed to maintain the required minimum residual. Ozone is not a substitute for a residual disinfectant because it does not carry its disinfection properties into the pool. Therefore, ozone must always be used in combination with a residual disinfectant such as chlorine.

Contact WorkSafeBC to learn about safe practices for working with ozone (<http://www.worksafebc.com/>).

5.9 BROMINE

Reference Section of Pool Regulation: *Schedule 3*

Bromine disinfectants, where used in place of chlorine disinfectant, must be maintained at the minimum concentrations Table 3 and should not exceed 5.0 ppm (except in hot tubs, which should not exceed 8.0 ppm). It is advisable to keep concentrations slightly above the minimum level to allow for a drop in response to increased use.

TABLE 3: REQUIRED MINIMUM CONCENTRATION OF BROMINE AS AN ALTERNATIVE DISINFECTANT

Disinfectant	≤30°C	>30°C
bromine	1.5 ppm	2.5 ppm

Bromine may be used in place of chlorine as a disinfectant. While it is widely used in private hot tubs, it is much less commonly used in regulated pools. Although its properties and function are similar to chlorine, it **may not** be as effective for killing some types of harmful bacteria such as *Pseudomonas*.

5.10 OTHER CHEMICALS, MEASURES AND CONSIDERATIONS

There are several other chemical parameters and measures that help maintain the balance of chemicals, indicate the disinfection capacity of water and contribute to the long term maintenance of a pool.

5.10.1 CALCIUM HARDNESS

The ideal range of calcium hardness is 180-220 ppm as shown in Table 4, below.

B.C. GUIDELINES FOR POOL OPERATIONS

The “hardness” of water generally refers to the amount of dissolved calcium and magnesium in pool water. Pool water hardness can be adjusted by dilution, using a water softener, or by increasing calcium by adding calcium chloride. The widely accepted range for pool calcium hardness is 180-220 ppm. Water that is low in total hardness is called "soft" while water that is high in calcium hardness is called "hard." Maintaining pool water outside the recommended range is not advised because it will have adverse effects on both patrons and pool equipment. Problems can be expected below 150 ppm and above 300 ppm.

If calcium hardness is out of balance, problems may develop (e.g., corrosivity, clogged filters, cloudy water, reduced circulation and pitting of concrete deck surfaces).

5.10.2 TOTAL DISSOLVED SOLIDS

The ideal range of total dissolved solids is 200-800 ppm as in Table 4.

Total dissolved solids (TDS) can be described as the measure of the sum of all dissolved material in pool water. High TDS can impair the effectiveness of disinfectants and other chemicals, and may contribute to corrosion, cloudiness, scale formation and other pool maintenance issues. Partial or total replacement of the pool water is recommended when TDS becomes excessive.

5.10.3 OXIDATION REDUCTION POTENTIAL (ORP)

Where ORP is measured, it should be maintained in the range of 700 mV-750 mV as shown in Table 4.

ORP is used as a measure for the effectiveness of disinfectants in pool water, and is often used in conjunction with an automatic controller. ORP above 650 mV is an indication that the water has good disinfection properties.

Ozonated pools may have higher ORP measurements (e.g., 900-1000 mV), since concentrations of ozone residual may remain in the water. This is due to multiple acting oxidizers in the water (i.e., chlorine and ozone) that increase ORP levels.

5.10.4 SALT WATER CHLORINATION

There is currently no specific guideline for salt concentration in pools; however, free chlorine residuals must still be maintained as required by the regulation (see section 5.5: Chlorine Disinfectant).

Salt water chlorine generation is an alternate method to traditional chlorine disinfection. Using this approach, the operator produces and uses chlorine onsite. This requires that the operator maintain salt in the pool water at approximately 2500 ppm. The salt in the pool water (sodium chloride – NaCl) is converted to sodium hypochlorite (NaOCl) through electrolysis, which typically occurs in specially designed sacrificial battery-like cells located in the pool’s mechanical room. These cells need to be replaced from time to time as per manufacturer’s recommendations to ensure proper functioning of the system.

Operators of salt water systems will need to respond to fecal accidents or periods of superchlorination by having an alternative chlorine source (e.g., sodium hypochlorite, calcium hypochlorite and lithium hypochlorite) to allow a quick response to fecal accidents and periods where the chlorine demand exceeds the capacity of the chlorine generating system.

5.10.5 POTASSIUM MONOPERSULPHATE

Potassium monopersulphate may be used to help reduce the concentration of combined chlorine residuals in pool water.

The use of monopersulphate may produce inaccurate total available chlorine readings, so operators should use caution not to add too much product. Over time, monopersulphate levels will subside, and chlorine readings will become more reliable.

Potassium monopersulphate is the active agent in most non-chlorine-based pool shock treatments, which are used to rid the pool water of excess combined chlorine. It is also known as peroxymonopersulphate, or just monopersulphate. The use of monopersulphate is often an attractive way to reduce combined chlorine levels because it does not require that the pool be closed for extended periods. Bathers can return to the pool after the chemical is dissolved and evenly distributed, provided the monopersulphate is used in the recommended dosage to pool water (follow product directions).

A monopersulphate residual will oxidize chloramines and organic waste in a similar manner as traditional pool disinfectants do. Monopersulphate, however, must be used in conjunction with a regular chlorine treatment program and not as a substitute. Operators must maintain the required free available chlorine levels while using this product. For more information on combined and free chlorine, refer to section 5.5: Chlorine Disinfectant.

5.11 ULTRAVIOLET LIGHT

Ultraviolet (UV) light may be used in combination with a residual disinfectant such as chlorine.

Ultraviolet light is sometimes used in conjunction with chlorine in the circulation system. It is not a substitute for a residual disinfectant, as it does not carry its disinfection properties into the pool. UV light therefore should be used in combination with a residual disinfectant such as chlorine. (Note: the maintenance required for UV systems, including lamp replacement, should be per the manufacturer’s instructions).

TABLE 4: SUMMARY OF WATER CHEMISTRY PARAMETERS

Component	Ideal Range	Recommended Maximum Allowable Levels	Testing Frequency
calcium hardness	180 – 220 ppm	300 ppm	weekly
total dissolved solids	200 – 800 ppm	800 ppm	weekly
stabilizer (cyanuric acid)	30 – 50 ppm	<80 ppm	weekly
ORP	700 – 750 mV	750 mV	every 4 hrs

PART THREE: QUALIFICATIONS FOR MAINTAINING AND OPERATING POOLS

1 OPERATOR TRAINING

Reference Section of Pool Regulation: *Section 11*

The operator of a pool must ensure that pool maintenance is performed regularly. This must be done by or under the supervision of a qualified person trained in pool maintenance. A “qualified person” is someone who has taken an appropriate program of instruction in pool maintenance (e.g., through courses provided by the BC Recreation and Parks Association, Recreational Facilities Association of B.C., etc) or has the equivalent combination of knowledge and skills.

Table 5, below, outlines the minimum competencies a basic course should contain to meet this requirement.

For new pools, it is recommended that at least one maintenance technician be on site for an adequate amount of time before opening to develop expertise with the pool systems, their operation and their potential risk to workers and the public.

Facility personnel (particularly maintenance personnel) must be familiar with the facility’s safety protocols and the use of equipment they are responsible for using and maintaining. They must understand the potential hazards to pool users that these systems present.

A basic course would be the minimum to meet the intent of the regulation for smaller facilities. Examples of the suggested course content are set out in Table 5.

Larger or more complex facilities should ensure personnel responsible for safety and maintenance of the pool are further trained in a more advanced course. Examples of the suggested course content are set out in Table 6.

TABLE 5: BASIC POOL OPERATIONS COURSE (14 TO 16 HRS)

<ul style="list-style-type: none"> • Pool Regulation, <i>Public Health Act</i> and other applicable legislation • pool types and designs • basic pool chemistry • water balance and testing • water circulation, filtration and turnover rate • pool volume calculations 	<ul style="list-style-type: none"> • alternate forms of disinfection • suction and entrapment hazards • preventative maintenance • seasonal maintenance • safe handling and storage of chemicals • troubleshooting problems
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TABLE 6: COMPREHENSIVE POOL OPERATIONS COURSE (14 TO 16 HRS)

<ul style="list-style-type: none"> • review of basic pool operations course information • advanced pool chemistry • water clarity • air quality (including operation of air exchange or HVAC systems) • filter sizing 	<ul style="list-style-type: none"> • hot water pools • diseases of pools and spas • custodial management/general maintenance • risk management • alternate forms of disinfection • troubleshooting/problem solving
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B.C. GUIDELINES FOR POOL OPERATIONS

Your local health authority may:

- Identify qualifications, including upgrading requirements, required of a person who maintains a pool.
- Develop core elements and objectives for pool maintenance courses that will provide training for people who want to acquire pool maintenance qualifications.
- Review any existing pool maintenance courses that are submitted to the health authority to determine if the course provides appropriate training.



Photo Credit: Oak Bay Recreation Centre

PART FOUR: POOL SAFETY PLANS

1 POOL SAFETY PLANS

Reference Section of Pool Regulation: *Section 13*

A pool operator must develop a comprehensive written pool safety plan customized for his/her facility that provides information about the actions to ensure the health and safety of pool patrons.

Maintenance technicians and pool staff should participate in the development of the pool safety plan, due to their familiarity with the operations of the pool on a day-to-day basis.

The plan is to be reviewed and updated as appropriate, or at least annually.

The *Pool Safety Plan Guide for Pool Operators* has been prepared in conjunction with the health authorities and stakeholders. It is posted on the Ministry of Health's website at:

http://www.health.gov.bc.ca/protect/ehp_recreational_water_quality.html.

The plan is to be made readily available to pool staff. Also, each staff member is to be trained in the pool's general safety protocols and the use of the equipment they are responsible for using and maintaining. It is pool operator's responsibility to ensure compliance with the plan by all employees.

Main components the plan must include are:

- Procedures to be followed in the event of a serious injury, emergency or incident.
- The type of lifesaving, lifeguarding and first aid equipment to be kept within the immediate vicinity of the pool.
- The number of lifeguards and other staff that are to be on duty while the pool is in use.
- Operating procedures for the pool.
- The program of cleaning and maintenance of the pool, including the nature and frequency of cleaning and maintenance.
- Staff training and maintaining staff qualifications.

The plan will be reviewed by your health officer. He/she is responsible for determining that, if the plan is followed, the pool operation will not likely constitute a health hazard and an operating permit can be issued.

The following sections in this document provide details on what is to be addressed in each component of the pool safety plan.

Clear written procedures for preventing and responding to incidents are critical for:

- Staff training.
- Reducing likelihood of adverse events.
- Responding effectively to incidents that impact the health and safety of patrons and staff.

Where moveable equipment – including portable diving stands, starting platforms and swing ropes – are provided for the use of bathers, facilities shall ensure that the equipment is in place on the deck only during periods when its use is directly supervised by aquatic personnel. The equipment can be hazardous to patrons if not supervised.

2 PROCEDURES FOR SERIOUS INJURY, EMERGENCY OR INCIDENT

Reference Section of Pool Regulation: *Section 13(2)(a)*

As part of the pool safety plan, each pool is to develop its own written plan on how to deal with serious injuries, emergencies and other incidents.

The section of the pool safety plan must:

- Include written procedures for handling serious injuries, emergencies and other incidents efficiently and safely.
- Describe both the equipment required in these situations and the related emergency procedures for staff to follow.
- Identify preventative measures to reduce risk of emergencies occurring.

Staff must know where all emergency and lifesaving equipment is located, and be trained to use it.

TABLE 7: SITUATIONS THAT MAY BE ADDRESSED IN A FACILITY'S POOL SAFETY PLAN

<p>Medical Emergencies</p> <ul style="list-style-type: none"> • near-drowning or drowning • unconscious/not breathing/no pulse • chest pain • spinal and/or head injury • broken bones and/or sprains • seizures • heat-related incidents • allergic reactions 	<p>Facility Emergencies</p> <ul style="list-style-type: none"> • gas leak (e.g., chlorine, ozone, natural gas and propane) • chemical spill • fire • power failure • sewer backup • electrical discharge • air quality
<p>Health/Hygiene Emergencies</p> <ul style="list-style-type: none"> • fecal/vomit incidents • blood and bodily fluid exposure (in and out of water) • disease outbreaks 	<p>Patron-related Emergencies</p> <ul style="list-style-type: none"> • entrapped person • hostile person • missing person • suction hazards
<p>Natural Disasters</p> <ul style="list-style-type: none"> • earthquake • flood • lightning 	<p>Other</p> <ul style="list-style-type: none"> • ambulance access • incident reporting • media response • incident stress debriefing

Facilities without lifeguards must establish and post emergency procedures, as well as the location of the emergency phone, first aid kit and emergency exits.

3 LIFESAVING AND FIRST AID EQUIPMENT

Reference Section of Pool Regulation: *Section 13(2)(b)*

Lifesaving and first aid equipment must be:

- Listed in the pool safety plan.
- Kept within the immediate vicinity of the pool.
- Accessible at all times that the pool is in operation.
- In good working condition.
- Checked regularly for defects and the need for maintenance or replacement.

3.1 LIFESAVING EQUIPMENT

Lifesaving equipment is to be mounted in conspicuous places (e.g., on the wall around the pool) and readily accessible for use at all times. Public pools must maintain the life-saving equipment listed in their pool safety plans. Pools over 10 m² in size and operating as commercial pools must have:

- A nonconductive reaching assist of at least 3.5 m (11.5 ft.) in length, with a shepherd's hook.
- A throwing ring, attached to a line of at least 6 mm in diameter and having a length of at least half the width of the pool + 3 m (10 ft.) mounted at poolside.

3.2 FIRST AID EQUIPMENT

The following emergency equipment is recommended to be in a pool safety plan, and in place at the facility:

- First aid kit. Refer to Schedule A-3 in the WorkSafeBC Occupational Health and Safety Regulations to determine the appropriate requirements, at:
http://www2.worksafebc.com/PDFs/firstaid/First_aid_guidelines.pdf#page=28.
- Personal protective equipment, including pocket masks and gloves.
- A spine board [with at least 3 Velcro straps and a head-security device].*
- Oxygen therapy equipment (400 litres or greater) with a regulator, protective carrying case and spare oxygen tank.*
- Full set of airways.*
- Automated external defibrillator (AED).*
- Eye-washing stations.

*This equipment is appropriate only at facilities with lifeguards or other personnel trained in their use.

3.3 EMERGENCY TELEPHONE

Reference Section of Pool Regulation: *Section 14*

To facilitate rapid contact with emergency services, the following must be in place in public pools:

- A telephone in a conspicuous location designated for contacting emergency services free of charge and marked with a sign.
- A procedure and script, including the facility address, for contacting emergency services posted close to the designated emergency telephone.

B.C. GUIDELINES FOR POOL OPERATIONS

- Telephone numbers of the nearest available hospital, ambulance service, police department and fire department displayed near the emergency telephone. In most cases this will be 911.
- Where a land-line phone is not available at a commercial pool, an alternate method of contacting emergency services should be established (e.g., emergency radio, cell phone and satellite phone).

4 LIFEGUARDS AND SUPERVISION

Lifeguarding requirements will be unique to each pool. The intent of this section of the pool safety plan is to:

- Describe the training required for lifeguards in your facility.
- Describe the opportunities for in-service and other training for staff.
- Provide staffing levels and schedules for all times the facility is in use.
- Develop written lifeguarding procedures for your facility.

4.1 UNSUPERVISED POOLS

Reference Section of Pool Regulation: Sections 13(2)(c) and 18

Some pools may operate without supervision by a lifeguard, including:

- commercial pools
- hot tubs
- spray pools
- wading pools

A commercial pool is one that is over 61 cm (24 in) in depth, and owned or operated by:

- A business enterprise that maintains private rooms or camping sites as accommodation for the public (other than an enterprise with fewer than four sites).
- A business enterprise that offers services only to persons holding membership with the enterprise.
- A strata corporation.

Examples of pools that may fall into this category include pools and hot tubs in most hotels, motels, inns, campgrounds, condominiums and apartments.

When a commercial pool, hot tub, spray pool or wading pool is operated without a lifeguard on duty, a clearly visible notice must be posted at each entrance to the pool stating that no lifeguard is on duty, and that children must be supervised by an adult.

A commercial pool or hot tub with a surface area greater than 10 sq m (108 sq ft) must also have, at poolside, a nonconducting reaching assist of at least 3.5 m (11.5 ft) in length with a shepherd's hook and a throwing ring, securely attached to a line of at least 6 mm (.25 inch) diameter and having a length of at least half the width of the pool plus 3 m (10 ft).

A public pool may also operate without a lifeguard provided that, during that period of time:

- The only individuals permitted access to the pool are those receiving aquatic instruction, and are closely supervised by an aquatic instructor and at least one other person responsible for assisting the instructor. The instructor and instructor assistant must be trained in the emergency procedures and the use of the emergency equipment described in the pool safety plan.
- A clearly visible sign is posted at each entrance to the pool stating that no lifeguard is on duty and that children must be supervised by an adult.

B.C. GUIDELINES FOR POOL OPERATIONS

- The pool is equipped with the lifesaving equipment required for a commercial pool (see above).

Although many pools may not be required by regulation to employ lifeguards, the pool operator may choose to employ lifeguards for any activities they deem necessary to protect patrons' health and safety.

4.2 MINIMUM STAFF REQUIREMENTS

Reference Section of Pool Regulation: *Section 17(2)*

A public pool operator must ensure that, when the pool is open to the public, pool supervision is provided by at least one lifeguard and any additional lifeguards as required by the pool safety plan.

There must also be at least one additional person who is trained in the procedures and use of the equipment described in the pool safety plan – and designated by the operator for this purpose – on duty within the swimming facility available to assist the lifeguard in an emergency.

However, if the pool is being used only for aquatic instruction, both an aquatic instructor providing close supervision of the persons being instructed and at least one other person, both trained in the emergency procedures and in the use of the emergency equipment described in the pool safety plan, must be on duty.

If staff members other than lifeguards are responsible for assisting lifeguards in emergency situations, the employer should provide training to ensure the nonlifeguard staff are:

- Familiar with the emergency procedures.
- Practised in their role in these procedures, through formal training and regular in-service training.
- Certified with a current CPR certificate (or Standard First Aid).

4.3 RATIO OF BATHERS TO LIFEGUARDS

The ratio of bathers to lifeguards, beyond the minimum staff identified in section 4.2 should be determined jointly by facility management and senior aquatic staff. This should be based on facility design, patron activity, patron age groups and other factors to ensure that ongoing vigilance occurs in all pool areas open for public use.

The minimum staffing levels are required to ensure adequate supervision of people in the pool, and must be identified in the pool safety plan.

4.4 LIFEGUARD QUALIFICATIONS

Reference Section of Pool Regulation: *Section 17(1)*

A lifeguard is a person who is:

- At least 16 years of age.
- Trained in the procedures and use of the equipment describe in the pool safety plan.
- Responsible for the conduct and safety of all pool patrons.
- Performs no duty other than pool surveillance.

It is also recommended that all staff be trained appropriate to their position and responsibilities. This may include:

- Regular in-service training.
- Training through external agencies.

B.C. GUIDELINES FOR POOL OPERATIONS

- Specialized training in handling related emergencies for lifeguards who are required to supervise specialized programs or facility features (e.g., scuba diving).

Lifeguard training should be a minimum of 40 hours in length and cover four key components:

- Knowledge – e.g., Pool Regulation, *Guidelines for Pool Operation*, pool safety plan, WHMIS/health and safety.
- Skill – e.g., lifeguard skills, effective management of distressed or drowning victim/suspected spinal injury/missing person.
- Fitness – e.g., level of anaerobic fitness, endurance, strength, power and flexibility that would allow the lifeguard to respond to emergencies safely and effectively.
- Judgment – e.g., incorporating knowledge, skill and fitness in responding to rescue situations.

Complete records should be kept describing and tracking attendance at in-service training. There should be follow-up on staff unable to attend the training or whose performance is deemed unacceptable.

5 OPERATING PROCEDURES

Reference Section of Pool Regulation: *Section 13(2)(d)*

Operators and maintenance technicians must identify correct operating procedures to ensure the health and safety of pool patrons and staff.

This part of the pool safety plan is to identify the proper procedures to be followed to:

- Test pool water chemistry.
- Adjust pool water chemistry.
- Backwash filters.
- Clean hair and lint strainers.
- Prime pumps.
- Apply diatomaceous earth to filters (where used).
- Handle disinfection chemicals and equipment.
- Ensure lockout procedures are in place so no one is injured during maintenance.
- Ensure play equipment (including temporary structures) is safe.

Operating standards – including safety procedures, rules for proper use, staff training in use, signage and operational controls – are to be included in the pool safety plan.

“Lockout” refers to circumstances in which workers must not put themselves in conditions where a piece of equipment could be inadvertently actuated – or where there is possible release of electrical, kinetic or stored energy; chemicals or hazardous substances; risk of engulfment by water or other means; etc. The requirement is that each worker who works in such circumstance has effectively de-energized, or “locked out” the equipment and placed a physical lock on the control point.

This list is a preliminary list of general provisions. More complex pool facilities will likely require more complex procedures. Where possible, pools should keep a copy of engineering plans and/or pool drawings on site to assist with troubleshooting problems.

Although lifeguards, maintenance staff and custodians work as a team, it is important that a clear distinction be made between the work done by each staff member, and it should be clear who is responsible for which tasks.

6 CLEANLINESS

Reference Section of Pool Regulation: *Section 13(2)(e)*

Operators must identify appropriate cleaning schedules to ensure the health and safety of pool patrons. This part of the plan is to include:

- Frequency of cleaning for each part of the pool.
- Chemicals and cleaners used.
- Lockout procedures to ensure no one is injured during cleaning.

More complex pools will require more complex cleaning procedures.

7 MAINTENANCE

Reference Section of Pool Regulation: *Section 13(2)(e)*

Operators must ensure pools are kept in good repair so that no health hazard exists. Operators must also ensure that pools are maintained on a regular basis by a qualified person. A “qualified person” is someone who has taken an appropriate program of instruction in pool maintenance (e.g., courses provided by the BC Recreation and Parks Association, Recreational Facilities Association of B.C., etc.) or has the equivalent combination of knowledge and skills. For more information see Part Three: Qualifications for Maintaining and Operating Pools.

As part of the pool safety plan, each pool must develop its own written maintenance program and train staff to implement the program. The program must identify the required equipment and procedures the staff must follow. A schedule for routine maintenance and equipment evaluation must ensure issues are identified and corrected before they become a problem.

The following situations are to be addressed in a facility's maintenance program:

- Ensuring water intakes do not present a suction hazard to bathers.
- Ensuring nothing in the pool presents an entrapment hazard to bathers, such as stairs or other physical structures in the pool water.
- Ensuring all areas of the pool are sufficiently lit so that all areas are visible.
- Carrying out regular testing of the equipment to ensure it is safe for use, functioning properly and maintained in accordance with manufacturer's recommendations.
- Carrying out regular testing and maintenance of the surfaces of walkways, stairs, decks and platforms to ensure they have not become a slip hazard due to becoming smooth and/or worn.
- Carrying out regular testing (at least monthly) of ground fault interrupters.
- Carrying out regular testing to ensure that when the pool is in operation, a minimum of 50% up to 75% of the water flow goes through skimmers. (A higher percentage of flow through the gutters and drains increases the cleansing action and reduces suction at the main drain/s).
- Preventing ice on walkways, steps and ladders of outdoor pools operated in winter.
- Ensuring all handrails are securely attached.
- Verifying the temperature of hot water (including showers) is below 49°C to avoid scalding injuries.
- Ensuring recirculation systems, including disinfection equipment and filters, functions properly.
- Ensuring water depth is clearly marked.
- Ensuring safe storage of chemicals.
- Ensuring the facility is free of sharp or blunt objects likely to cause injury.
- Ensuring the facility is not deteriorating in a way that would allow bacterial/fungal growth, or cause injury.

- Regularly inspecting wave chamber bars in wave pools for structural integrity. (Inspections should be documented and the records retained for seven years).

8 PREVENTING SUCTION HAZARDS

Reference Section of Pool Regulation: *Section 11(1)(b)*

Special attention in the pool safety plan must be given to establishing operating procedures that ensure water returning to the recirculation system from the pool does not become a suction hazard.

Routine maintenance should be done to ensure suction fittings and inlets are secure and in good repair.

The operator must ensure that:

- Suction points are designed to prevent a person from being held on to the suction point.
- Inlet fittings are designed to prevent the entrapment of bathers.
- The pool has skimmers or gutters that are designed to prevent the entrapment of bathers.
- Each main drain:
 - Is located at, or as close as possible to, the deepest part of the pool basin.
 - Is covered with a grate that cannot entrap a person or be readily removed by a person.
- Circulating pumps have an effective vacuum-breaking design.
- No equalizer lines terminate in the pool basin.
- Submerged equalizer lines or equalizer fittings in the pool, if they exist, are disabled.
- When drain covers are replaced, replacement covers ensure the pool water does not pass through the drain gate at a speed greater than 46 cm per second when the pool is operating at the design flow rate – [s10(2)(k)] of the Pool Regulation. (Where required, contact a design professional, such as an engineer or architect, for advice on a replacement model.)

A complete set of pool drawings should be available and on site for easy reference by pool staff. Manuals on pool operation and maintenance, as well as technical data sheets, should also be available at the pool. It is recommended that these manuals:

- Provide complete information from the manufacturer regarding maintenance needs of suction points.
- Are updated as required.
- Include information from the pool architect or engineer designer regarding potential hazards.

The pool or hot tub must be closed immediately if any suction fitting is damaged, defective or missing.

SUCTION HAZARDS

Suction has caused many deaths and severe injuries that could have been prevented. Water inlets can cause suction strong enough to entrap body parts or hair, causing a bather's head to be held under water, leading to drowning. In addition, there have been reports of incidents in which the suction from the pool or spa drain has led to disembowelment. Any drain the body can cover completely, combined with a plumbing layout that allows a build-up of suction if the drain is blocked, presents a suction hazard.

9 PROCEDURES FOR SUCTION OR ENTRAPMENT RELATED EMERGENCIES

The pool safety plan must identify procedures to be followed to free someone who has become trapped or held against a suction point. It is recommended that pool owners train staff to:

- Shut down the pumps immediately if someone becomes entrapped.
- Ensure scissors are readily available that can be used to cut hair that has become entrapped.
- Follow established procedures for draining the pool.
- Follow any other procedures that are necessary to free a person trapped under water.

10 CHEMICAL STORAGE AND HANDLING

Reference Section of Pool Regulation: *Section 11(2)(h)*

Chemicals must be stored safely and in a location that is secure from unauthorized entry at all times (e.g., doors are locked and appropriately signed). Where disinfection systems other than gaseous chlorine are used (e.g., hypochlorite or bromine), the disinfection chemicals must be kept separate from any acidic products.

The material safety data sheets (MSDS) for chemicals located on site should be reviewed for specific storage concerns and incompatibility with other chemicals.

A list should be made of incompatible chemicals to make this clear to staff. For incompatible chemicals, storage areas are to be configured to:

- Ensure they are stored on separate shelf units from each other.
- Where storage space is very limited, achieve separation by storing incompatible products off the floor (such as on pallets), so that spilled material will not contaminate containers of other chemicals.
- Ensure they are not stored above one another to avoid contamination by spilling.

For specific storage requirements for chlorine gas systems, see the *Chlorine Safe Work Practices* manual: http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/chlorine.pdf.

Chemicals commonly used in pools can be dangerous on their own or if they react with other chemicals. Spills or leaks can be corrosive, or can react with other chemicals leading to fire, smoke, poisonous gases or other hazards. Chlorine (or bromine) delivery chemicals (e.g., hypochlorite and isocyanurate) and acids will react violently to release chlorine (or bromine) gas.

11 GAS CHLORINE OPERATION AND MAINTENANCE

Gas chlorine storage and handling shall be performed in a manner to prevent injury to workers and public and in accordance with WorkSafeBC standards, and should include, but not be limited to the following procedures:

- Gas chlorine tank changes are performed by staff fully trained in doing this, and in the emergency procedures required in the case of a leak.
- The emergency procedures include contact with the local emergency agency familiar with the facility, and capable of handling a gas chlorine leak.
- The chlorine leak detector includes a visual and/or audible alarm in an area where staff will take notice immediately.
- The tank change procedure includes two staff members – one changing the cylinder and the other outside the chlorine room observing.

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- Tank regulators and related feed equipment are serviced at least annually by a qualified technician.
- Chlorine detectors are tested at least every month, and calibrated annually by a qualified technician.

For more information on safe chlorine gas storage and handling, contact WorkSafeBC or refer to *Chlorine Safe Work Practices*: http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/chlorine.pdf.



Photo Credit: Oak Bay Recreation Centre

APPENDIX A: EXAMPLE OF POOL RULES

1 POOL RULES

BEFORE ENTERING OUR POOL YOU MUST:

- Ensure you are not ill – including diarrhea, vomiting, open sore(s), bandages, head colds, discharging ears or noses, or ear infections. Persons with related symptoms should not enter the pool until 48 hrs after cessation of these symptoms.
- Wear clean and appropriate bathing attire.
- Take a cleansing shower.
- Ensure all children less than 7 years of age are closely supervised (within arm’s reach at all times) by a responsible person of at least 16 years of age.
- Ensure infants and toddlers wear swim diapers and/or elastic swim pants.
- Ensure one responsible person supervises a maximum of three children who are less than 7 years of age.
- Report an injury suffered while in the pool enclosure, to the pool manager or lifeguard.
- Report any contamination or fouling of the pool (e.g., urinating or defecating), to the pool manager or lifeguard.

WHEN IN OUR POOL YOU MUST NOT:

- Run, fight or engage in any conduct likely to cause an injury.
- Contaminate or foul the pool.
- Dive into the pool, except in designated areas.
- Use or be under the influence of alcohol or other intoxicants.

2 HOT TUB RULES

BEFORE ENTERING OUR HOT TUB YOU SHOULD:

- Consult with your doctor if you:
 - Are an elderly person.
 - Have heart disease, diabetes, or high or low blood pressure.
 - Are taking medication for cardiovascular or nerve disorders.
 - Are pregnant.
- Always have someone with you in the hot tub.

WHEN IN OUR HOT TUB YOU MUST:

- Enter and leave the hot tub slowly and cautiously.
- Keep long hair out of the water, away from all underwater fittings, especially suction fittings.

WHEN IN OUR HOT TUB YOU MUST NOT:

- Dive into the water.
- Stay in the hot tub for more than 10 minutes at one time (long exposure may result in nausea, dizziness or fainting). Once you are finished you should:
 - Shower to cool down.
 - Then, if you wish, return for another brief stay.
- Totally immerse your body.
- Use or be under the influence of alcohol or other intoxicants.

3 SUPERVISION OF CHILDREN

- Keep children less than 7 years of age, especially infants, out of hot tubs and spas. Their small bodies overheat too fast.
- Children must be constantly supervised. Unsupervised use by children is not allowed.
- Water temperatures must not be hotter than 40°C (104°F).

4 SLIDES

- One rider at a time.
- Wait until the landing area is clear before entering the slide.
- Slide only in the sitting position or on your back.
- Do not attempt to stop on the slide.
- Leave the plunge area immediately.
- Users of the slide are to be of an age and size to manage the slide.

B.C. GUIDELINES FOR POOL OPERATIONS

APPENDIX B: EXAMPLE OF A POOL AND HOT TUB WATER TESTING AND MAINTENANCE LOG

POOL AND HOT TUB WATER TESTING AND MAINTENANCE LOG

Date

Year

Name of Pool

Location

Date	Time	Initials	Free Chlorine	Total Chlorine	Combined Chlorine	pH	Total Alkalinity	Calcium Hardness	Cyanuric Acid	Flow Rate	Clarity	Temperature	Bather Load (note)	Comments / Notes
														1. Enter reading in appropriate column 2. Chemicals added / amount 3. Make-up water added 4. Backwashed / cleaned filters 5. Vacuumed 6. Mechanical breakdown 7. Swimmer incident or complaint 8. Fecal accidents 9. Other tests / maintenance / issues

Note: Bather load to be based on # of patrons in pool at time of testing.

B.C. GUIDELINES FOR POOL OPERATIONS

RECOMMENDED PARAMETERS FOR POOL AND HOT TUB WATER CHEMISTRY PARAMETERS

Parameters	Minimum	Maximum	Test Frequency
free chlorine (<30°C)	0.5 ppm	5.0 ppm	min. 2x/day
free chlorine (>30°C)	1.5 ppm	5.0 ppm	min. 2x/day
chlorine cyanurate (<30°C)	1.0 ppm	5.0 ppm	min. 2x/day
chlorine cyanurate (>30°C)	2.0 ppm	5.0 ppm	min. 2x/day
bromine (<30°C)	1.5 ppm	5.0 ppm	min. 2x/day
bromine (>30°C)	2.5 ppm	5.0 ppm*	min. 2x/day
combined chlorine	0 ppm	<1.0 ppm	min. 2x/day
pH	7.2	7.8	min. 2x/day
total alkalinity	80 ppm	120 ppm	at least weekly
calcium hardness	180 ppm	220 ppm	weekly
cyanuric acid (outdoor pools only)	30 ppm	<80 ppm	at least weekly

*Bromine in hot tubs should not exceed 8.0 ppm.

Notes:

B.C. GUIDELINES FOR POOL OPERATIONS

APPENDIX C: EXAMPLE OF A MAINTENANCE AND CLEANING SCHEDULE

MAINTENANCE AND CLEANING SCHEDULE

Task	Frequency	Person Responsible	Equipment Required	Remarks
Check and record water parameters in pool and hot tub.	7 a.m., 5 p.m. and after busy periods	maintenance technician	pool test kit, thermometer, log book	Make adjustments to water parameters as needed.
Inspect decks, diving boards, railings slides, play equipment for conditions that may injure patrons.	before opening pool to patrons in morning	head lifeguard		Close or restrict access to any area that may be injurious to patrons. Inform management to arrange for it to be repaired.
Check that first aid kit is fully stocked.	before opening pool to patrons in morning	lifeguard #2		Order replacement items as necessary – refer to pool safety plan for full list.
Check pool drain covers are securely attached.	before opening pool to patrons in morning	lifeguard #2		Close pool if found to be loose or damaged. Inform head lifeguard and management to arrange for it to be repaired.
Clean and sanitize toilets, sinks, change room floors.	twice daily or as necessary	custodian	cleaning solution, bleach, gloves, sponge, mop, bucket	Clean with soap, then sanitize with bleach water solution.
Check temperature of hot water in taps.	before opening pool to patrons in morning	maintenance technician	thermometer	Adjust to ensure hot water temperature is less than 49°C.
Check and clean lint and strainer baskets.	twice daily or as necessary	custodian		

APPENDIX D: EXAMPLE OF CHEMICAL STORAGE AND HANDLING PROCEDURES

PROCEDURES TO ENSURE NO ONE IS INJURED DURING CLEANING (E.G., LOCKOUT, POOL CLOSURES)

Chemical Name and Use	Location (where chemical is to be used)	Do Not Store next to, or Allow to Mix with the Following:	Special Handling Considerations	Material Safety Data Sheet (MSDS)

APPENDIX E: EXAMPLE OF AN EMERGENCY CONTACT LIST

EMERGENCY CONTACT LIST		
(Post next to the telephone or in another visible location if no telephone available.)		
First Responders		
Ambulance	911 or ()	
Fire Department	()	
Police	()	
Building Contacts Trained in First Aid / Emergency Response / CPR		
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
	()	Cell phone ()
Additional Contact Information		
Local Hospital	()	
Poison Control	()	
Health Authority/Health Protection 24/7 Emergency On Call	()	
Pool Company	()	
Gas Company	()	
Above List Reviewed and Updated By:	Print Name:	
Date	Print Date:	

APPENDIX F: INCIDENT RESPONSE

INCIDENT RESPONSE PROCEDURES

Incident	Response Procedure
<p>medical emergencies (may expand to include procedures for specific incidents)</p>	<ul style="list-style-type: none"> • Apply first aid as necessary. • Call ambulance: <ul style="list-style-type: none"> - Explain nature of emergency. - Explain best place for them to meet staff. - Send someone to meet ambulance and direct it to most practical entrance.
<p>patron’s hair caught in water intake</p>	<ul style="list-style-type: none"> • Shut off pumps. • Cut hair with scissors to extract patron. • Clear pool. • Call ambulance. • First aid/AR as necessary.
<p>patron held on to pool drain by suction</p>	<ul style="list-style-type: none"> • Clear pool. • Shut off pumps. • Call ambulance. • First aid/AR as necessary.
<p>missing person</p>	<ul style="list-style-type: none"> • Clear pool.
<p>fecal accident</p>	<ul style="list-style-type: none"> • Clear pool. • Follow fecal accident procedure. • Record incident in water maintenance log.
<p>blood or bodily fluid clean-up</p>	<ul style="list-style-type: none"> • Follow WorkSafeBC guideline.
<p>hostile patron</p>	
<p>fire</p>	
<p>power failure</p>	
<p>earthquake</p>	
<p>flood</p>	
<p>lightning</p>	

B.C. GUIDELINES FOR POOL OPERATIONS

The Emergency Response Procedures chart, above, provides examples of:

- Common incidents that can occur in the pool environment.
- Sample responses for some of these incidents.

This list is not exhaustive, and should be customized to:

- Address what is likely to happen in your facility.
- Be the appropriate response, given the number of staff, level of training, location of facility, etc.
- Include entire procedures in the list, or refer to more detailed procedures elsewhere in the plan.

A more extensive list can be found in the *Pool Safety Plan Guide for Pool Operators* on the Ministry of Health's website at: http://www.health.gov.bc.ca/protect/ehp_recreational_water_quality.html

APPENDIX G: EXAMPLE OF A FECAL INCIDENT CLEAN-UP PROCEDURE

PROTOCOL FOR HANDLING FECAL INCIDENTS IN POOL WATER

Fecal incidents are a concern and inconvenience for both pool operators and patrons. Pool operators should explain to patrons why the pool needs to be closed in response to a fecal incident. Understanding that pool closure is necessary for proper disinfection and protection of the health and safety of swimmers is likely to promote support rather than frustration. Pool closures allow chlorine to do its job: kill germs and help prevent recreational water illnesses.

A diarrhea fecal incident is a higher risk event than a formed stool incident. With most diarrhea illnesses, the number of infectious germs in each bowel movement decreases as the diarrhea comes to an end and the person's bowel movements return to normal. Therefore, a formed stool is probably less of a risk than a diarrheal accident that you may not see.

A formed stool is generally associated with healthy individuals and may contain few illness-causing germs. The germs that may be present are less likely to be released into the pool because they are mostly contained within the stool. However, formed stool also protects germs inside from being exposed to the chlorine in the pool, so prompt removal is necessary.

When developing procedures for your facility (for inclusion in your pool safety plan) that are specific to dealing with these types of incidents, refer to the U.S. Center for Disease Control website for guidance:

<http://www.cdc.gov/healthywater/pdf/swimming/pools/fecal-incident-response-recommendations.pdf>

All fecal incidents are to be recorded in a log book including the date, time of the incident, type of incident, concentration of free available chlorine and ORP at the time, pH, procedures followed and the person(s) conducting the procedures.

Contact your health authority on the next working day to advise them of the actions you have taken.

APPENDIX H: EXAMPLE OF LIFESAVING, LIFEGUARD AND FIRST AID EQUIPMENT

The following lifesaving equipment will be located and mounted at poolside for use at all times the pool is open:

- A lifesaving device such as a rescue tube or rescue can.*
- A nonconductive reaching pole with shepherd's hook at least 3.5 m long.
- A throwing ring with a 6 mm in diameter line securely attached having a length of not less than half the width of the pool plus 3 m.

The following emergency equipment will be located at _____:

- Spine board [with at least three Velcro straps and a head-security device].*
- Oxygen unit (500 litres or greater) with regulator, delivery system, protective carrying case and spare oxygen tank.*
- Full set of airways.*
- Personal protective equipment, including a pocket mask with oxygen inlet and one-way valve and gloves.
- Minimum of a #2 first aid kit (or as per WorkSafeBC).
- Automated external defibrillator (AED).*
- Eye-washing stations.

*This equipment is appropriate only at facilities with lifeguards or other personnel trained in their use.

APPENDIX I: EXAMPLE OF A POOL SUPERVISION SCHEDULE

POOL SUPERVISION SCHEDULE

Program	Number of Lifeguards	Support Staff Required	Remarks

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APPENDIX J: OTHER RELATED AGENCIES

AGENCIES WITH AN INTEREST IN THE DESIGN AND OPERATIONS OF POOLS

Agency	Jurisdiction	Rules/Standards/Guidelines
WorkSafeBC http://www.worksafebc.com	worker safety	Occupational Health and Safety Regulation
	chlorine	<i>Chlorine Safe Work Practices Manual</i>
	ozone	<i>Ozone Safe Practices Manual</i>
	air quality	
BC Safety Authority http://www.safetyauthority.ca/	elevating devices (waterslides)	Elevating Devices Safety Regulation CSA Standard Z267-00
Ministry of Natural Gas Development (and responsible for Housing) http://www.housing.gov.bc.ca/building/	building standards	B.C. Building Code
	access for persons with disabilities	
Local Governments http://www.civicinfo.bc.ca	land zoning bylaws business licenses and building permits building inspections	Community Charter

APPENDIX K: USEFUL CONVERSIONS AND MEASUREMENTS

CONVERSIONS AND MEASUREMENTS

Category	Unit		Multiply by	=	Unit
area	square ft (f ²)	X	0.092903	=	m ²
	square inch (in ²)	X	6.4516	=	cm ²
	square yard (y ²)	X	0.8361	=	m ²
length	ft (ft or ')	X	0.30480	=	m
	ft (ft or ')	X	30.480	=	cm
	inch (in or ")	X	0.0254	=	m
	inch (in or ")	X	2.54	=	cm
lighting	lux (lx) (SI)	X	0.0161028	=	W/m ²
	lumen (lm) (SI)	X	0.001496	=	W
	lumens/sq ft	X	1	=	ft-candles
	Lux	X	0.0929	=	ft-candles
mass/weight	ounce (oz)	X	0.0283495	=	kg
		X	28.3495	=	g
	pound (lb or #)	X	0.453592	=	kg
		X	453.592	=	g
pressure	pound per square inch	X	6894.75729	=	kg/m*sec ² (Pa)
		X	68947.5729	=	g/cm*sec ²
volume	ounce fluid (fl. oz)	X	29.5734	=	mL
	ounce fluid (fl. oz) (Imp)	X	28.413063	=	mL
	gallon (gal)	X	0.0037854	=	m ³
		X	3.7854	=	L
	gallon (gal) (Imperial)	X	4.54609 x 10 ⁻³	=	m ³
	X	4.54609	=	L	

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Category	Unit		Multiply by	=	Unit
		X	4.54609×10^3	=	mL
	tablespoonful (tbsp)	X	15.0	=	mL
	teaspoonful (tsp)	X	5.0	=	mL
	cubic ft (ft ³)	X	0.0283168	=	m ³
		X	28.3168	=	L
	cubic inch (cu in)	X	16.3871	=	mL
	drop (gtt)	X	0.08333	=	mL
	cup (c)	X	236.587	=	mL
velocity	centimeters/sec	X	0.03281	=	ft/sec
	meters/sec	X	3.281	=	ft/sec
water volumetric flow	litres/min	X	4.40×10^{-3}	=	gals/sec
temperature	(degrees Celsius	X	1.8) + 32	=	degree Fahrenheit
	(degrees Fahrenheit	-	32) x .556	=	degrees Celsius

Metric	Imperial
1 milligram per litre (in solution)	= 1 ppm
1 cubic ft of water	= 62.4 pounds
1 cubic ft of water	= 6.24 Imperial gallons
1 US gallon of water	= 8.34 pounds
1 Imperial gallon of water	= 10 pounds

APPENDIX L: GLOSSARY

Alkalinity: The measure of the ability of the water to resist changes in pH. The higher the alkalinity, the more difficult it can be to adjust the level of the pH. The ideal range for alkalinity is 80 to 120 ppm.

B.C. Building Code: Provides the minimum requirements for a safe building environment. It is the product of a partnership between industry practitioners, construction technology experts and provincial regulators. These requirements include all construction, plumbing and fire codes that each building in B.C. must meet prior to occupancy.

Bromine: An alternative to chlorine as a disinfectant. Chemically, both chlorine and bromine are effective for neutralizing pathogens, parasites and algae.

Calcium Hardness: The total mineral content of the pool water. It is composed of calcium, magnesium, iron, manganese and other elements.

Canadian Standards Association (CSA): Develops standards that enhance public safety and health, advance the quality of life and help to preserve the environment.

Chlorine: An effective disinfectant widely used to maintain sanitation within a pool facility. It is available in three chemical states: solid, liquid and gas.

Combined Available Chlorine (CAC): Chlorine that has already reacted with organic matter and bacteria. They began as FAC molecules, but have disinfected a microbe and are now referred to as CAC or chloramines.

Commercial Pool: A pool that is over 61 cm (24 in) in depth, it is owned, operated and used only by members, shareholders, tenants or patrons of a business enterprise or a strata corporation and is not open to the general public.

Cyanuric Acid: A chemical used to prevent the decomposition of chlorine by ultraviolet light. Cyanuric acid is used in outdoor pools and is of little value in indoor pools.

Decks: Walkways surrounding a pool. Outdoor facilities often have concrete decks, while indoor facilities may have concrete or tiles decks. Pool operators are responsible for sanitation and upkeep of the decks.

Free Available Chlorine (FAC): The available chlorine disinfectant that is active in most pools.

Hot Tubs (also called Whirlpools or Warm Water Pools): An artificially created body of water used as a hydrotherapy pool or whirlpool, or for similar recreational bathing or therapeutic purposes. These pools have additional health risks due to the heat and the relaxing effects of the water. Users are more at risk of heart attacks, strokes or other ailments. The additional heat can also be a breeding ground for pathogens and parasites.

Lifeguard: A person who is at least 16 years of age, familiar with the pool safety plan, responsible for the conduct and safety of all pool patrons and is performing no duty other than pool surveillance.

Lockout: Circumstances in which workers must not put themselves in conditions where a piece of equipment could be inadvertently actuated – or where there is possible release of electrical, kinetic or stored energy; chemicals or hazardous substances; risk of engulfment by water or other means; etc. The requirement is that each worker who works in such circumstance has effectively de-energized, or “locked out” the equipment and placed a physical lock on the control point.

Lockout Procedures: The use of locks to render machinery or equipment inoperable or to isolate an energy source. The purpose of a lockout is to prevent an energy-isolating device (e.g., switch, circuit breaker or valve) from

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accidentally or inadvertently being operated while workers are performing maintenance on machinery or equipment.

Maximum Bather Load: The maximum number of bathers allowed in a pool at one time for health, safety and engineering reasons. The bather load will be specified on the pool's operating permit and/or the pool's data sheet.

Oxidation Reduction Potential (ORP): The activity or strength of oxidizers and reducers in relation to their concentration. Examples of oxidizers are chlorine, hydrogen peroxide, bromine, ozone and chlorine dioxide.

Ozone: The molecule containing three atoms of oxygen, known to be a very powerful sanitizer. Ozone-producing equipment creates this molecule by UV radiation or corona discharge generators.

pH: The measure of acid and base levels for liquids. Water that has a pH level of 7.0 is "neutral" water. Water that has a pH level above 7.0 is "basic" water. Water that has a pH level below 7.0 is "acidic" water. The ideal range for pH in a pool is 7.2 to 7.8.

Parasite: An organism that benefits at the expense of the host without killing the host. It creates a symbiotic relationship with the host to draw from it, while not killing it. Common parasites are *Cryptosporidium*, *Streptococcus* and *Staphylococcus*.

Pathogen: Any infectious agent causing disease to the host. Infectious agents can pass from host to host through airborne means (e.g., sneezing), primary contact (e.g., hand contact), secondary contact (e.g., door handles) or through the environment (e.g., pool or hot tub). Common pathogens are viruses, bacteria and fungi.

Pool Safety Plan: A comprehensive and customized plan developed to ensure the health and safety of pool patrons.

Pool Patron: A person within the pool enclosure, whether or not the person is using the pool or has paid a fee to be within the pool enclosure.

Public Pool: A pool that is over 61 cm (24 in) in depth and available to the general public for swimming, recreational bathing or physiotherapy purposes, either free of charge or for a fee.

Potassium Monopersulphate: A chemical compound designed to oxidize organic contaminants in a pool or spa. It can be used to help reduce the concentration of combined chlorine residuals in pool water.

Salt Water Systems: When salt is dissolved in water, the resulting solution is called brine. When an electrical charge is passed through brine, one of the byproducts is chlorine gas that can then be used to disinfect water.

Spray Pools and Spray Parks: An artificially constructed depression or basin for use by children, into which potable or recirculated water is sprayed but not allowed to accumulate in the bottom. This is often the centrepiece for a recreational play area that features water spraying from various shaped structures.

Superchlorination: Subjecting pool water to an extremely high chlorine dosage to remove or delay combined chlorine. This process ensures that the free chlorine residual is high enough to inactivate or destroy harmful organisms.

Total Available Chlorine (TAC): The sum of free available chlorine and combined available chlorine.

Total Dissolved Solids (TDS): The total weights of a soluble matter in the water including salt/sodium, waste, algaecides, minerals, stain control chemicals and clarifiers. The ideal range for TDS is 200: 800 ppm.

Turnover: The rate at which water in the pool is circulated, physically cleansed and replaced. It is the measure of the time it takes for the full volume of water to pass through the entire circulation system.

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Ultraviolet Light (UV): A secondary form of disinfection effective in killing bacteria and germs. UV is invisible light with a wavelength less than that of visible blue light.

Wading Pool: An artificially created body of water intended for wading purposes and having a depth of less than 61 cm (24 in).

WorksafeBC: An agency that promotes workplace health and safety for workers and employers through education, consultation and enforcement. In the event of work-related injuries or diseases, WorkSafeBC works with the affected parties to provide return-to-work rehabilitation, compensation, healthcare benefits and a range of other services.