B.C. GUIDELINES FOR POOL DESIGN

VERSION 2

JUNE 2014

HEALTH PROTECTION BRANCH
MINISTRY OF HEALTH

BRITISH COLUMBIA

PREFACE

The B.C. Pool Regulation, B.C. Reg. 296/2010 (pursuant to the *Public Health Act*) is an outcome-based regulation. This document, *B.C. Guidelines for Pool Design*, is intended to help designers, operators and regulators interpret the regulation, with respect to pool design. The guidelines represent generally accepted standards of safe practices. Depending on the type of pool and the use to which it is put, higher design standards may be necessary. It is the responsibility of each pool owner to ensure optimum water quality and pool safety.

In this document, "should" indicates a generally accepted design 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 regulation(s). Where there is a discrepancy between any B.C. legislation and these guidelines, the legislation shall prevail.

The guidelines may be reviewed and updated from time to time. Please visit the Ministry of Health's Recreational Water Quality website[1] for updates.

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

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1 CONSTRUCTION PERMIT

1.1 CONSTRUCTION PERMIT APPLICATION PROCEDURE

Under the Pool Regulation, a person must not construct a pool unless he/she holds a construction permit and complies with the terms and conditions of the permit, if any. For information on the permitting process, contact your local health authority.

An application for construction permit must be filled, signed, and submitted to a health officer. Included in the application form are pool information sheets. The person applying for the construction permit shall ensure the pool information sheets are duly completed by the project design professionals.

Design professionals are design architects registered or licensed under the *Architects Act* and/or design engineers who are registered or licensed as a professional engineer under the *Engineers and Geoscientists Act*. The pool information sheets will be considered as statements of fact to support the health officer's evaluation and decision to issue a construction permit under the Pool Regulation s.5(3). Where the project involves more than one design professional, each design professional must initial the items pertaining to their respective design responsibilities.

As well as the application for construction permit, all related plans and specifications for the construction as prepared, sealed and certified by an architect or engineer must be submitted to the health authority. The pool owner, or their authorized agent, must sign the declaration in this application for construction permit, confirming the pool will be constructed in accordance with the plans and specifications accompanying the application for construction permit.

The application for a construction permit is available in Appendix C.

1.2 POOL REPAIRS AND ALTERATIONS

Pool repairs and alterations require a construction permit, unless a health officer waives the requirement for one, per Pool Regulation Section 5(6). Such pools must follow the application procedure outlined in section 1.1, including the completion of the pool information sheets. In these cases, only health-hazard-related design parameters relevant to the pool repair or alteration need initialing on the pool information sheets from the design professional.

1.3 CONSTRUCTION PERMIT WAIVERS

The health authority must be notified of any proposed or planned construction and supplied with any information the health officer may require. Based on the information provided, the health officer can advise on whether or not a construction permit is required.

According to Section 5(6) of the Pool Regulation:

A health officer may waive the requirement for a construction permit

(a) on request of a person and after receiving any information the health officer may require, and

(b) if the proposed construction is a repair or alteration

(i) performed for emergency purposes, or

(ii) that is so minor that requiring a construction permit is not necessary to protect the public interest.

2 OPERATING PERMIT

A person must construct the pool in accordance with the plans and specifications submitted with the construction permit application, unless prior written approval is obtained from a health officer.

Once the pool is constructed, an annual operating permit will be required before operation (with the exemption of certain spray pools[2]). As part of the information package supporting the application for an operating permit, a signed statement from an engineer or architect must be submitted. This signed statement must confirm 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. A completed pool data sheet providing details of the pool as constructed must also be provided. The pool data sheet is available on the Health Protection website.[3]

Where the project involves more than one design professional, each design professional may submit a signed statement and completed pool data sheet covering only their respective design responsibilities. These signed statements must be submitted together and cover all aspects of the pool construction.

A pool safety plan must also be prepared and submitted as part of the operating permit application process. The pool safety plan is a written plan that provides information and describes actions to protect the health and safety of pool users. It provides clear procedures for staff training, facility maintenance and upkeep, and incident response – reducing the chance of harmful events.

The pool safety plan should include information on the pool design. This information can be summarized into a pool data sheet for easy reference, in addition to operating manuals and record drawings. A pool safety plan template is provided in the *Pool Safety Plan Guide for Pool Operators*, available on the Health Protection website.[4] For operation-related guidance, please refer to the *B.C. Guidelines for Pool Operation*.[5]

[2] Spray pools that drain to a waste water collection system and do not recirculate the pool water are exempt from the operating permit requirement.

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

[4] http://www.health.gov.bc.ca/protect/pdf/pool-safety-plan.pdf

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

PART TWO: POOL DESIGN

3 POOL SURROUND

3.1 POOL ENCLOSURE/FENCES

Fences or other controlled-access barriers around pools are required to restrict access, minimize contamination of water by foreign materials, and reduce the risk of drowning, especially for young children.

Fences are not required under the Pool Regulation for spray pools or wading pools that are drained when not in use. In the case of a spray pool that recirculates water, fencing should be in place to keep animals out of the spray pad area to help maintain pool water quality.

FENCES

While fencing is required in order to minimize access to pools by unauthorized persons and animals, the main purpose of fencing is to prevent access to pools by unsupervised young children to minimize the risk of drowning. The following design standards are intended to minimize unauthorized access to pools by young children and should be considered in the design and installation of a pool fence or barrier:

- The outside of the pool fence should be 1.5 m (5 ft) high all the way around the perimeter of the pool area.
- The design of the pool fence should be nonclimbable with no indents or projections:
  - Avoid fence details that could create a climbing hazard.
  - Avoid decorative fences and walls that provide toe and finger holds.
- The bottom of the pool fence should be less than 10 cm (4 in) above the ground all the way around the perimeter of the pool area so that a small child cannot get under it.
- The vertical or near vertical pickets should be less than 10 cm (4 in) apart so that a small child cannot slip between them.
- All horizontal or near-horizontal fence rails should be more than 115 cm (45 in) apart so that a small child cannot step from one rail to another.
- Decorative cutouts in fencing should be no more than 44 mm (1.75 inches) in width.
- Diagonal openings in chain-link and wood lattice types of fences should not have any openings that would allow the passage of a spherical object having a diameter exceeding 38mm (1.5 inches).
- The top of the pool fence should be 1.5 m (5 ft) away from any objects that could help a small child climb over the fence (e.g., barbeques, trees, rocks, shrubs and deckchairs) (Figures 1 and 2):
  - The length of the radius of the quadrant should be equal to the fence height or distance to the nearest climbable object.
  - Avoid locating pool barriers so close to uphill slopes that a person could step or jump onto or over the pool barrier.

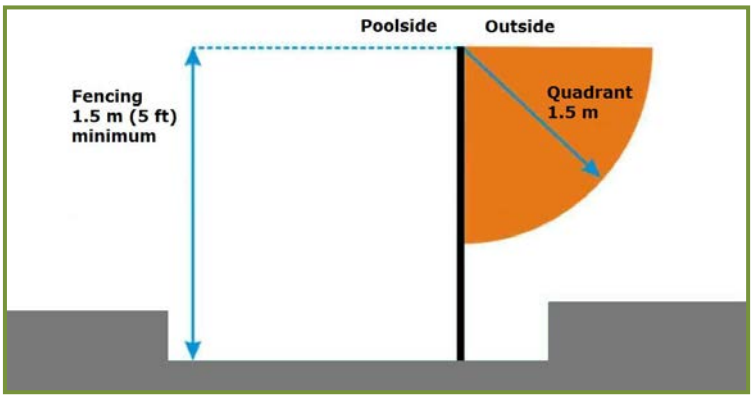

FIGURE 1: ACCEPTABLE DISTANCE FROM CLIMBABLE FEATURES

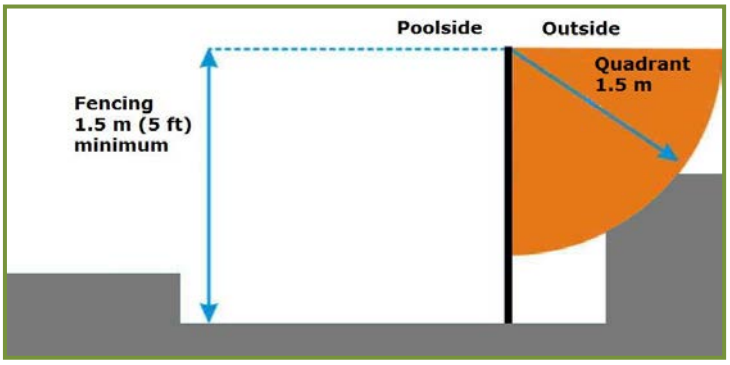

FIGURE 2: UNACCEPTABLE DISTANCE FROM CLIMBABLE FEATURES

- The enclosure and latches should be of a strength and rigidity to withstand a foreseeable impact from people.
- Direct access to the pool should be prevented from all buildings including rental units (hotel room, townhouses, etc.). Private courtyards should not be open to the pool deck: either the pool area is fenced or each courtyard is equipped with a fence and gate (self-closing, self-latching).

SOLID BARRIERS

A solid barrier, such as brick, concrete or manufactured rock faces, may be considered in lieu of a fence. No indentations or protrusions should be present, other than normal construction tolerances and masonry joints. The Brick Industry Association's Guide Specifications for Brick Masonry has established a maximum vertical alignment tolerance of 0.64 cm (0.25 in) from plumb in 3.05 m (10 ft) for brick walls and other types of masonry construction such as manufactured rock walls.

HEDGES, BUSHES AND PLANTINGS

Hedges, or other plants, do not constitute a fence or solid barrier and are not acceptable in lieu of a fence.

GATES

Pool fence gates should:

- Be self-closing, self-latching; and as deemed necessary, lockable.
- Be supported on substantial hinges capable of supporting 90 kg (200 lb) of body weight.
- Have a latch operating mechanism that is:
  - At least 1.4 m (4.5 ft) above the ground.
  - Located on the inside of the pool enclosure.
- Swing outwards away from the pool.

Where entry gate latches are less than 1.4 m (4.5 ft) above the ground:

- Door and gate latches should be provided with a continually locked, key carded or other equivalent access control system.
- A solid material with a radius of at least 46 cm (18 in) should protect the latch in doors and gates that are constructed of materials that may allow children to reach through the fence. See Figure 3.

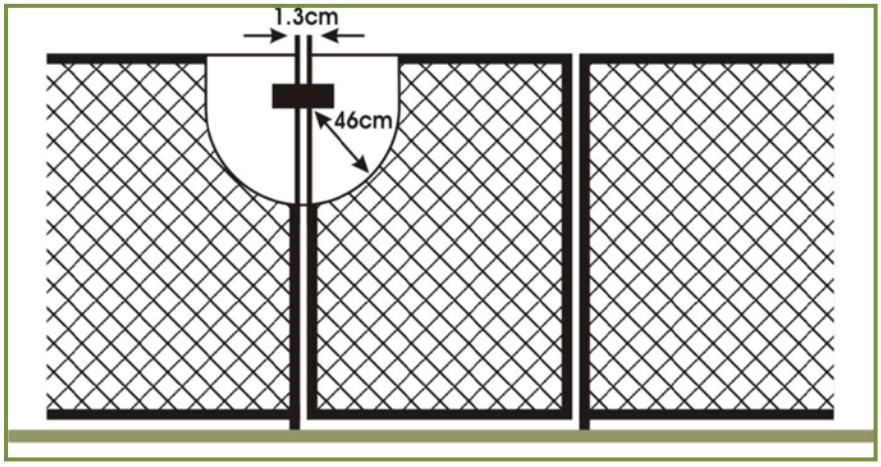

FIGURE 3: LATCH PROTECTION DETAIL FOR LATCHES LESS THAN 1.4 M ABOVE GROUND

INTERIOR POOL ENCLOSURES

Walls can serve as an access barrier for interior pools. Walls with doors and windows that have a sill height of less than 1.2 m (4 ft) should not be used as part of the pool enclosure.

OTHER CONSIDERATIONS

- Fencing structures that provide a flexible opening should be evaluated to ensure the dimensions do not exceed standards when light forces, such as those a child could exert, are applied to the barrier (e.g., tempered glass that flexes on its supports). The opening cannot exceed 10 cm (4 in) when flexed.
- Additional fencing requirements may exist in local bylaws. Many local bylaws recommend a fence height of 1.5 m (5 ft) or greater for backyard (residential) pools. This height may be enforced by the local building department for commercial pools.

- A fence height of 1.5 m (5 ft) or greater should be used where a pool is located:
  - Near a (public) pedestrian walkway or thoroughfare.
  - Near a road or parking lot.
  - Adjacent to a bar, restaurant, patio, etc.

3.2 DECKS AND DECK DRAINS

Pools should have sufficient room surrounding them to allow patrons – including those with disabilities – to pass safely and allow staff and emergency workers access to all areas of the pool. There should be sufficient room for an ambulance gurney to pass easily.

POOL DECK

A continuous walkway should extend completely around the pool and should:

- Provide a minimum walkway width of 1.2 m (4 ft) beyond the edge of the pool.
- Maintain a 1.2 m (4 ft) wide deck around obstructions – provided adequate emergency access can be attained – for pools with features beside the pool (e.g., slides, columns, play features, rolled-up pool covers) that obstruct access to the pool at that point.
- Provide drainage away from the pool edge in a manner that will not create muddy, hazardous or objectionable conditions with the pool enclosure, and will facilitate washing and drainage without obstructions to the drains.
- Slope to drain with a minimum uniform slope of 2% (1 in 50) and a maximum slope of 4% (1 in 25), except for wheelchair (accessible) ramps.
- Have decorative features, where used, (such as those used to direct foot traffic) that are slip-resistant, and do not interfere with deck drainage or impede emergency access.

Internal pool walls or walls that divide pools into one or more sections that are not intended to be walked on may be less than 1.2 m (4 ft) wide. Signage should be placed indicating “no bather access,” as appropriate. Such dividing walls should be capped with a finish that discourages patrons from standing or walking on these surfaces (e.g., decorative rocks).

DECK DRAINS

Deck drains should:

- Be at least 10 cm (4 in) across and covered with a grating with openings that do not cause toe entrapment (approximately 8 mm/0.3 in).
- Be designed and installed to have no sharp edges that could cause injury.
- Retain a slip-resistant texture and cause no discomfort to bare feet.
- Be spaced no more than 7.6 m (25 ft) apart so that no more than 37.2 m^2 (400 sq ft) of walkway area is contributing to any one drain.
- Be connected to a drainage system that is designed in accordance with good engineering practice and the B.C. Building Code (current edition).

POOL COVERS

Pool covers, where used, should not impede emergency access to any point along the pool perimeter. This can be achieved through the use of roll-away pool covers, recessed pool cover spools, or wall mounted pool cover spools. Pool covers may be installed on the pool deck provided that:

- A 1.2 m (4 ft) wide deck space is maintained around the perimeter of the pool so that adequate emergency access can be attained.
- Deck drainage is not impeded.
- Cover hardware does not pose a slipping, tripping or stubbing hazard.

REDUCED WALKWAYS

Pools that are less than 10 m^2 (108 sq ft) in area may have a reduced walkway width of 60 cm (2 ft) for up to 75% of the pool perimeter. Such pools may include hot tubs and therapeutic pools. The access to the pool should be from a walkway 1.2 m (4 ft) or greater in width.

ACCESSIBILITY

See section 3.9 for information on deck design for accessibility.

3.3 FLOORING

Flooring within the pool area – including floors in dressing rooms, shower stalls, toilet areas, decks, stairs, and other walking areas, as well as flooring cove joints – should:

- Be made of durable material that is impervious to moisture and designed to minimize bacterial growth.
- Allow for easy and thorough cleaning.
- Retain a nonslip (slip-resistant) texture and cause no discomfort to bare feet.
- Be free of tripping hazards such as uneven surfaces or changes in elevation.
- Be free from physical hazards that could cause injury to bare feet.
- Be designated by the manufacturer as suitable for walking surfaces in wet areas or for use in pool areas.
- Be coved at the wall juncture for ease of cleaning.

SLIP RESISTANCE

In 2012, the Tile Council of North America adopted the AcuTest DCOF test as the specified method for determining the coefficient of friction (COF) for tiles. Overseas, similar tests for determining DCOF, such as the British Pendulum, Tortus, or German Ramp, are used. The DCOF test replaces ASTM Standard C1028-96 (Standard Test Method for Determining the SCOF of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method) as the standard method of determining the COF of a tile. This was formalized with the inclusion of the DCOF test in ANSI A137.1 2012, the American National Standard Specifications for Ceramic Tile. While tiles used in pools are not required to adhere to ANSI A137.1, the standard represents an industry best practice.

DCOF tests measure the COF that is required to initiate a slip from a moving (**dynamic**) object, compared to ASTM C1028, which determines the COF required to initiate a slip from a stationary (**static**) object. ANSI A137.1 2012 states that tiles used in wet, level environments should have a dynamic coefficient of friction (DCOF) of at least 0.42. This is roughly equivalent to a static coefficient of friction (SCOF) of at least 0.6. Since both tests are not performed on bare wet feet, there is an element of subjectivity in determining whether the tiles will provide an adequate nonslip surface upon installation.

As tiles may or may not adhere to ANSI A137.1, both the SCOF and DCOF are considered acceptable measures of COF. Since most slips on wet surfaces involve a person who is already in motion, preference is given to the DCOF measure.

Adherence to a COF guideline value does not imply that the tile is slip-resistant. There are many variables that affect the risk of a slip occurring. The designer should consider these factors – such as tile size, intended area usage, traffic, slope, contaminants and maintenance – when assessing the suitability of a tile for the application.

Other slip resistance test methods from Germany and Australia provide a wet barefoot rating (e.g. DIN 51097 Slipperiness Classification; Standards Australia and CSIRO Handbook HB 197 – *An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials*).

These wet barefoot ratings are not absolute. For example, the Standards Australia HB:197 recommends that swimming pool surrounds have a “B” slip-resistant surface. However, some facilities have had unsatisfactory performance from their B surface with regard to the number of slip-related accidents. The Royal Life Saving Society of Australia has published a complete section on facility design in its *Guidelines for Safe Pool Operation* manual. This includes specific recommendation that Category C tiles should be used for:

- pool concourses
- pool edges, stairs, ramps and beach entries
- shallow-end floors (where bathers can stand) of competition and lap pools
- toddlers /learners pool floor

TILE SLIP RESISTANCE TREATMENTS

Use of chemical treatments to enhance the slip resistance of existing tiles should be discussed with a health officer prior to application. In some cases, these treatments can affect the tile’s integrity and lead to maintenance difficulties.

TILE SIZE

Smaller tiles – less than 10 cm x 10 cm (4 in x 4 in) on pool decks and 5 cm x 5 cm (2 in x 2 in) in pool basins – help reduce slip hazard. Since smaller tiles have a greater density of grout lines than larger tiles, smaller tiles provide more slip resistance than larger tiles of the same material. Tiles greater than 15 cm x15 cm (6 in x 6 in) – are not recommended due to potential slip hazards and difficulty in maintaining pool deck slope.

CONTRASTING COLOURS

The use of contrasting colours or textures should be limited to the delineation of edges such as those on stairs, ledges, and drop-offs. Also, the use of contrasts on floors and deck surfaces for reasons other than delineation may pose challenges to those with impaired cognition or limited vision.

HOSE BIBS

Hose bibs should be provided in sufficient number to allow for cleaning throughout the pool area. They should be equipped with a CSA or equivalent hose bib vacuum breaker for cross-connection control.

DOORS AND WINDOWS

Doors and windows within the pool area should have frames, glazing and materials that:

- Minimize uncontrolled condensation.
- Withstand humid and corrosive environments.
- Minimize or do not contribute to bacterial growth.

3.4 LIFEGUARD STANDS

Lifeguard stands (including lifeguard chairs) are not required by regulation. The need for lifeguard stands should be based on factors such as facility design, bather load, patron age and activity. The important outcome is that the pool is under complete and vigilant surveillance at all times. Whether that is best done from the pool deck, a lifeguard stand or a combination is a matter of best judgment by an experienced lifeguard, supervisor and/or pool manager at a pool facility.

Where installed, the number, location and use of lifeguard stands should be included in the pool safety plan. Lifeguard stands may be secured to the pool deck, or moveable stands may be used. Lifeguard stands should be built specifically for lifeguarding use, such as those available from pool equipment suppliers, with considerations for visibility, chair stability and ease of entry/exit.

3.5 DIVING BOARDS AND PLATFORMS

DEPTHS AND CLEARANCES

Pools where diving is permitted should have adequate clearances and a water depth greater than 2 m (6.5 ft) for safe deck-level diving.

Clearances and water depths for pools with springboards, diving platforms, starter blocks, and pools used for sanctioned aquatic competitions or training for competitions involving shallow entry dives are outlined in Sections 2, 3, 5, and 6 of the Federation Internationale de Natation Amateur (FINA)'s Facility Rules.[6]

See the *B.C. Guidelines for Pool Operation* for details on portable diving stands.

[6] http://www.fina.org/H2O/index.php?option=com_content&view=category&id=88:facilities-rules&Itemid=184

SURFACES

Diving boards and steps leading to diving boards are to have slip-resistant surfaces.

There should be at least 1.2 m (4 ft) of clear deck space surrounding all diving equipment, including stairs and ladders.

POOL BASIN MARKINGS

Wall fittings and any other necessary fittings should be installed so that a lifeline can be placed at the 2 m (6.5 ft) depth to designate the boundary between the swimming area and the diving area of the pool.

Alternatively, a 10 cm (4 in) wide marking strip of contrasting colour may be placed down the sides and across the floor of the pool at the 2 m (6.5 ft) depth to designate the boundary between the two areas.

3.6 DECORATIVE ROCKS

Decorative rock features should:

- If located adjacent to shallow pool water:
  - Be next to a “no diving” sign and set back from the pool edge so patrons cannot jump from it into the pool, or
  - Be placed at the pool edge if the feature is less than 30 cm (12 in) in height and occupies no more than 5% of the pool perimeter.
- If located at or adjacent to deep pool water:
  - Be considered a diving platform. Therefore, the adjacent pool area should conform to diving envelope design specified in this document.
- Have a nonslip surface without sharp or cutting edges in any areas that provide a potential foothold, stepping or standing access.
- Have an easily cleaned and maintained surface that does not encourage bacterial growth.
- Not allow water to pool.
- Slope to drain water away from the pool.

3.7 LANDSCAPING

Landscaping should be designed with drainage that drains away from the pool deck. For interior pools, planters should be watertight and fitted with a drainage system. There should be sufficient surrounding barrier width to prevent soil or water from the planters or landscaping to discharge onto the deck area. Barriers should be slightly raised or inclined to prevent floor-cleaning water from entering the planter.

Select plantings and planting locations so that the pool areas remain visible to lifeguard staff and no deep shadows are developed when plants have fully matured. Consider barriers such as pickets or hedges at the landscape edge of the pool deck to discourage bather traffic onto the landscaped areas.

SOIL

Soil can contain bacteria, such as *Pseudomonas aeruginosa*, which could contaminate the pool water if allowed to drain onto the pool deck.

3.8 SPECTATOR SEATING

Spectator seating should allow for at least 1.2 m (4 ft) between the edge of the pool and the seating. Consideration should be given to accessibility for disabled spectators and designing a separate exit to the outdoors so spectator traffic does not go through the swimming area.

Refer to Part B, Section 3.3 of the B.C. Building Code (2012 Edition) for details on assembly seating.

3.9 ACCESSIBILITY

According to the B.C. Building Code (2012 Edition), access for disabled patrons must be provided for all public facilities rated as Group A, Division 3, including pools. Public facilities should be designed such that a disabled individual is able to access and circulate within the pool facility. Areas where design for accessibility is required include external access, changing and toilet facilities, and means of pool and spa entry and exit.

Where pool facilities are to be designed for accessibility for disabled patrons, the design shall be in accordance with the current edition of the B.C. Building Code.

Special considerations specific to pool accessibility that may not be covered in the B.C. Building Code should be designed following good design practices, such as the use of the ADA Accessibility Guidelines[7] (the guidelines' Section 15.8 is on swimming pools) or the U.S. Access Board's Accessibility Guidelines for Recreation Facilities Swimming Pools and Spas.[8] Where there is a conflict between the ADA Accessibility Guidelines and the B.C. Building Code, the Building Code requirements shall prevail.

DECK DESIGN

Deck design for accessibility should include:

- Wheelchair access to pool and change facilities.
- Storage space for mobility aids near pool entrance (areas where walkers, canes and wheelchairs can be stored without creating a trip hazard).
- Seating areas along stretches of walkways for those who may easily tire when walking long distances.

LIFTS AND HOISTS

Where used, lifts and hoists for accessibility should:

- Be removable when not in use, or designed in such a way that they do not to project in the pool and pose a hazard to swimmers.
- Maintain a 1.2 m (4 ft) deck around the lift or hoist except along the pool edge.

[7] http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/113-ada-standards/background/adaag#15.8
[8] http://www.access-board.gov/attachments/article/594/pools.pdf

- Provide sufficient clear deck space for a lift user to position a wheelchair next to the lift (e.g., an area extending relative to the back of the lift chair or sling, 30 cm behind, 1.2 m in front, and 0.9 m away from the pool deck).
- Be positioned according to the manufacturer's requirements.

4 POOL BASIN

4.1 POOL BASIN SURFACES AND FINISHES

POOL BASIN SURFACES

A pool basin should:

- Have a slip-resistant bottom surface where the water depth is less than 1.5 m (5 ft) including lane markers, patterns, and other design features.
- Have a smooth bottom surface where the water depth is greater than 1.5 m (5 ft).
- Have a surface made of durable material that:
  - Is imperious to moisture.
  - Allows for easy and thorough cleaning.
  - Causes no discomfort to bare hands and feet.
- Be free of tripping hazards such as uneven surfaces.
- Be free of physical hazards that could injure bare feet.

Hot tub walls should have smooth vertical surfaces to promote ease of cleaning. Junctions between pool walls and floors should be coved with a radius of curvature of no less than 2.5 cm (1 in) and no more than 15 cm (6 in).

POOL BASIN FINISHES

Pool basin finishes can include tile, glass, and both plain and painted concrete. The pool basin finish should have the following properties:

- nontoxic and nonhazardous
- does not pose a cutting, pinching or abrasive hazard
- easy to clean
- durable and watertight
- no cracks or open joints
- able to withstand design stresses

4.2 UNDERWATER PROJECTIONS

There should be no submerged projections in a pool other than properly marked stairs, steps, safety ledges, seats or benches.

Underwater ledges may be provided on vertical walls at the deep end of a pool. They should:

- Be a maximum of 15 cm (6 in) wide.

- Be at least 1.2 m (4 ft) below the water surface.
- Have ledge noses rounded and marked in a contrasting colour.

Seats and benches may be installed in a pool basin. Seats and benches should:

- Have a slip-resistant surface.
- Have edges marked in a contrasting colour.
- Be located outside of water slide landing areas and other high-use locations that could cause a safety hazard to bathers.

4.3 POOL BASIN FLOOR SLOPE

Pool floor slopes should be uniform and not greater than:

- 1 in 12 where the water depth is less than 1.5 m (5 ft).
- 1 in 2 where the water depth is greater than 1.5 m (5 ft).

Wading pools and spray pools floors should have a maximum slope of 1 in 15 and a minimum slope of 1 in 50. Wading pool floor slopes should be uniform. There should be no abrupt dropoffs in a pool.

FLOOR SLOPES
Maintaining safe floor slopes lets patrons move safely into deeper water.

4.4 POOL BASIN COLOUR AND PATTERNS

POOL BASIN COLOUR

Light reflectance value (LRV) is a measure of the amount of light reflected by a colour and may be used to determine the suitability of a pool basin colour. For ceramic tiles, the LRV is measured using the ASTM C609 – 07: Standard Test Method for Measurement of LRV and Small Color Differences between Pieces of Ceramic Tile. Not all manufacturers have LRV data for their finishing materials. In these situations, the finishing material may be compared to the LRV of an equivalent paint colour.

Pool basin colour should:

- Be white or light in colour (generally have an LRV of at least 60%):
  - An International Lifesaving Society study (2007) found that white pool walls and bottom provided greatly improved visibility over light blue colours.[9]
  - Light-green tiles can make detection of algae or water quality problems difficult.
- Not obscure steps, changes in depth, underwater patrons, objects or debris.
- Limit darker areas (LRV of greater than 60%) to lane lines, accents on patterns, stair noses, etc., as long as the darker areas will not unreasonably interfere with the visibility of patrons in the water.

POOL BASIN PATTERNS

Pool basin patterns and designs should:

- Not be of a size and shape that could be mistaken for a human body.

[9] http://www.ilsf.org/drowning-prevention/library/factors-affecting-lifeguard-recognition-submerged-victim-implications

If there is question as to whether a final finish colour, or pattern of colours, is acceptable, a 150 mm (6 in) diameter black disk at the deepest point of the pool or spa should be clearly and immediately seen by an observer standing on the pool deck at a point closest to the disk.

If the pool basin incorporates a number of different colours, designs or patterns, then a drawing of the pool floor area with the proposed colours, designs or patterns should be submitted with the application.

4.5 DEPTH MARKINGS

Depth markings for pools should:

- Be visible to swimmers in the pool.
- Clearly indicate the numerical depth of water in Arabic numerals with a minimum height of 10 cm (4 in).
- Be of a colour contrasting with background.
- Be located:
  - For gutter pools, above the water surface on the pool wall and on the walkway at the pool edge.
  - For deck level pools, overhead or on another structure, as long as the markers are in full view from all locations in the pool and along the pool edge.
- Be located at:
  - Maximum and minimum depths.
  - 30 cm (1 ft) depth increments between the shallow depth and the point of break inclusive.
  - Intervals of no more than 7.6 m (25 ft) measured on the periphery of the pool.

Depth markings may be omitted for hot tubs with a surface area of under 10 m^2 (108 sq ft) where health hazards are managed through other signage, such as “no diving” signs.

UNITS FOR DEPTH MARKINGS

Section 11(2)(f) of the Pool Regulation requires that the depth of water be clearly marked in a pool. While metric units should be used for new pools, the use of imperial units, or both imperial and metric units, are considered acceptable for existing pools.

4.6 STEPS, STAIRS AND LADDERS

A suitable means of entry and exit should be provided for all patrons. Access to a pool can be achieved through the use of stairs, recessed and semi-recessed steps, and/or ladders. Where pools are to be used by the elderly, young children, or individuals with mobility impairments, stair access should be provided.

GENERAL REQUIREMENTS

Stairs, steps (recessed and semi-recessed), and/or ladders should be:

- Provided at the shallow end of the pool if the vertical distance from the bottom of the pool to the deck or walkway exceeds 1.2 m (4 ft).
- Provided at the deep portion of the pool (steps and ladders only):
  - If the pool is over 10 m (32 ft) wide at the deep end, steps or ladders should be installed on each side of the pool.

- Installed so as not to interfere with competitive events.
- Secure and of slip-resistant design.
- Resistant to corrosion by pool water.

STEPS AND LADDERS

Steps (recessed and semi-recessed) and ladders should:

- Have at least four rungs/steps when placed in water depths greater than 1.5 m (5 ft).
- Be provided with suitable handrails on both sides to allow safe use.
- Have hand rails not more than 61 cm (2 ft) apart.
- Have a uniform distance between ladder treads or steps of between 18 cm (7 in) and 31 cm (12 in).

STEPS

Steps leading into a pool may be semi-recessed or fully recessed into the pool basin. These steps should:

- Be at least 13 cm (5 in) wide and 30 cm (12 in) long.
- Where semi-recessed, protrude no more than 6.4 cm (2.5 in) from the pool wall.
- Have drainage towards the pool.

LADDERS

Ladders leading into a pool should have:

- Treads at least 7.6 cm (3 in) wide and 33 cm (13 in) long.
- A clearance distance from the pool wall of less than 9 cm (3.5 in) or greater than 23 cm (9 in).

STAIRS

Stairs leading into a pool should have:

- A minimum tread depth of 31 cm (12 in) and a maximum rise or height of 26 mm (10 in).
- The nose marked in a contrasting colour.
- A handrail within reach from all areas of the stair – i.e., no more than 75 cm (2.5 ft) away from a handrail.

Stairs leading into hot tubs with a surface area less than 10 m^2 (108 sq ft) – whether prefabricated and cast in place should have a minimum tread of 23 cm (9 in) and a maximum rise or height of 32 cm (12.5 in).

4.7 HANDRAILS AND GUARDRAILS

This section should be read in conjunction with section 4.6. Guardrails and handrails should:

- In accessible pools, be designed according to best practices, such as those outlined in the ADA Accessibility Guidelines.[10]

[10] http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/113-ada-standards/background/adaag#15.8

- For diving boards, be designed with reference to the FINA Facilities Rules (current edition, Section FR5).[11]
- Have vertical rails on diving platform guardrails to prevent swimmers from falling and becoming entrapped.
- Serve all treads.
- Be made of corrosion-resistant materials to allow for gripping in wet environment.
- Be inset in the walls or have a clearance distance of less than 9 cm (3.5 in) or greater than 23 cm (9 in) from walls to reduce the risk of entrapment.

Consideration should also be given to installing handrails or grab bars in strategic locations where falls are most likely to occur – e.g., on stairs and ramps.

Where a piece of equipment is designed to be used by those under the age of 12, additional considerations should be given to the following:

- The size of the handrails should be of reduced diameter to accommodate smaller hands.
- Additional guard rails should be provided to prevent falling or becoming entrapped.
- Designers can reference CSA Standard CSA-Z614: Children's Playspaces and Equipment for guidance.

5 POOL FACILITIES

5.1 CHANGE ROOMS

Pool facilities should include the following:

- Change rooms, toilets and showers should be located no more than 60 m (197 ft) walking distance on hard surfaces (i.e., avoiding grassed and dirt areas) from the pool.
- Change rooms should be divided into two parts (for males and females), with entrances and exits screened with partitions to break the line of sight – except for universal change areas (see below).
- Change rooms, toilets and showers should be arranged so that bathers pass from the toilet or dressing room area through the shower area and then directly to the pool area.
- There should be minimum opportunities for patrons in bare feet and those in street shoes to walk in the same area.
- Change rooms and toilet spaces should be ventilated to minimize condensation.
- Lockers and cubby holes, if supplied, should be well ventilated, raised at least 10 cm (4 in) off the floor, and readily cleanable.
- Privacy screens should be of sufficient height off the ground to allow cleaning.
- Floors in change rooms, shower rooms and toilet areas should:
  - Be made of durable material that is impervious to moisture.
  - Retain a texture that is slip-resistant to bare feet.
  - Cause no discomfort to bare feet.
  - Have a minimum uniform slope to drain of 1 in 50.

[11] http://www.fina.org/H2O/index.php?option=com_content&view=category&id=88:facilities-rules&Itemid=184&layout=default

- Walls and partitions should be of smooth, durable, impervious material, free from cracks or open joints.
- Junctions between walls and floors should be coved to facilitate easy cleaning.
- Hose bibs of not less than 1.91 cm (0.75 in) diameter should be available. Hoses should be a maximum length of 23 m (75 ft) and recessed, where possible, or located away from traffic areas.

MINIMUM CHANGE ROOM SURFACE AREA (FLOOR SPACE)

The minimum change room area required for each bather should be at least 0.32 m^2/bather (3.44 sq ft). The overall change room area for a facility is the sum of the change room areas in the male, female and universal change areas. The change room area excludes gang showers, washrooms, halls, exits and entrances.

Change rooms may be omitted in certain situations such as apartments, hotels, motels or condominium pools where users have access to these facilities nearby, however a toilet, hand washing sink, and shower should be provided conveniently near the pool.

UNIVERSAL CHANGE AREA (FAMILY CHANGE ROOM, CHANGING VILLAGES)

Mixed-gender change areas may be provided in addition to separate-gender change areas. These areas may consist only of cubicles or have a mixture of cubicles and enclosed rooms. To ensure privacy in the universal change area:

- Cubicles in the universal change area should be designed to avoid any gaps between partitions and walls, and between partitions and cubicle doors.
- The partition and door height of the cubicle should be a minimum of 2.2 m (7.2 ft) to prevent those standing on the change area benches from seeing over the partition.
- Partitions and doors should be sufficiently low to the ground, approximately 10 cm (4 in), to prevent anyone from looking under the partition or door.

5.2 PLUMBING FIXTURES

Plumbing fixtures requirements for pool facilities are outlined in the B.C. Building Code (current edition). Bather loads should be assumed to be equally divided between males and females. For universal change rooms, the maximum equivalency for general (non-gender-specific) plumbing fixtures in the universal change room is counted as a maximum of one type of fixture per gender.

ACCESSIBLE AMENITIES

Where accessible water closets, urinals, lavatories, or showers are provided for each gender, the fixture count will be included in the overall gender-fixture count on a 1:1 basis. The accessible amentities are to be designed in accordance with the requirements set out in the B.C. Building Code (current edition).

DRINKING WATER

There should be at least one drinking fountain for each 250 bathers, or portion thereof, to be located in the pool area. For outdoor pools, water drinking fountains may also be located indoors in the access hallways to the pool.

5.3 TEMPERATURE OF SHOWER WATER

Both the Pool Regulation and the 2012 B.C. Building Code require that hot water provided in pool facilities not exceed 49°C (120°F). Hot water provided in pool facilities should also:

- Be provided in the recommended range of 32°C (90°F) and 43°C (109°C).
- Minimize the risk of scalding through the use of thermostatic tempering or mixing valves.
- Where manual valves are used, be suitably marked to differentiate between the hot and cold supply.

6 UTILITIES

6.1 NATURAL AND ARTIFICIAL LIGHTING

Under Section 11(2)(a) of the Pool Regulation, lighting must be sufficient to illuminate all portions of the pool to ensure all areas are visible to patrons, the operator and lifeguards. In addition to the Pool Regulation, there are lighting requirements in the Occupational Health and Safety Regulation (Sections 4.64 to 4.69) and, where applicable, the 2012 B.C. Building Code (Section 3.2.7: Lighting and Emergency Power Systems).

Underwater lights may be used to help achieve sufficient illumination and must follow the B.C. Electrical Code. Lighting, whether natural or artificial, should:

- Be designed to minimize glare and reflectance from the pool.
- Be arranged to provide uplighting, which is preferred over direct lighting as it provides even light distribution across the pool area and minimizes glare.
- Supply and maintain at least 161 Lux (15 ft candles) of illumination at all points 76 cm (30 in) above the water surface.
- Supply and maintain at least 10 ft candles of illumination on the deck and in areas of the change rooms used by bathers.
- Follow the best practices outlined in the Illuminating Engineering Society Standard IESNA RP-6-01, Sports and Recreational Area Lighting.

EMERGENCY LIGHTING

Part B, Section 3.2.7 of the 2012 B.C. Building Code provides details on the requirements for emergency lighting. Emergency lighting should also be provided for outdoor pools used at night.

Design illumination levels should be indicated at the time of application for a construction permit. Once the construction is complete, the illumination levels should be confirmed and signed-off by the project electrical engineer.

6.2 ELECTRICAL REQUIREMENTS

All electrical devices, including ground fault circuit interrupters (GFCIs), must be installed in pools in accordance with the B.C. Electrical Code (current edition, Section 68) to reduce the risk of injury due to electrocution. Existing pools that are unable to comply with the B.C. Electrical Code should discontinue the use of the out of compliance equipment.

6.3 AIR QUALITY, HUMIDITY, HVAC SYSTEMS

Pool HVAC systems must be designed in accordance with the B.C. Building Code (current edition). The designer should also refer to other relevant codes and standards (such as ASHRAE standards) as part of good engineering practice. ASHRAE Standard 62.1: Ventilation for Acceptable Indoor Air Quality has specific provisions on pool indoor air quality.

Pool HVAC systems should:

- Provide an air exchange rate adequate to protect public health and prevent the accumulation of condensation, odours, or hazardous or toxic substances. (The *ASHRAE 2011 Handbook of HVAC Applications* recommends 4-8 air changes per hour.)
- Maintain a humidity level of between 50% and 60% in the pool area.

CHLORAMINES

HVAC systems should be designed to minimize indoor air quality issues associated with disinfection byproducts such as chloramines (the smell normally associated with pools) at the pool level. Chloramines are formed when free chlorine reacts with ammonia contained in bodily fluids (e.g., sweat, urine and perfume).

Currently there are no WorkSafe BC occupational exposure limits for chloramines; however, a reference value of 0.3 mg/m^3 has been recommended in other jurisdictions.[12] Provision of deck-level ventilation can help manage chloramine levels near the pool surface. Designers and operators should be aware that adjustments to ventilation rates, often to save on heating and energy costs, may create air quality issues at the pool level.

[12] Parrat, J., Donze, G., Iseli, C., Perret, D., Tomicic, C., and Schenk, O. (2012). "Assessment of Occupational And Public Exposure to Trichloramine in Swiss Indoor Swimming Pools: A Proposal for an Occupational Exposure Limit." Annals of Occupational Hygiene, 56(3), 264-277.

PART THREE: CIRCULATION SYSTEM

7 GENERAL

7.1 WATER QUALITY

Source water and water quality in pools must be acceptable to the health authority and meet the requirements outlined in the Pool Regulation. The health authority may require that potable water as defined in the *Drinking Water Protection Act* be used in wading or spray pools, and to fill a pool.

7.2 WATER CIRCULATION

DESIGN FLOW RATE

All pools, except flow-through pools, should be designed to circulate water continuously. The design flow rate for pools should be as follows:

- Public pools should have a maximum turnover period of six hours (rate of four or more per 24 hours).
- Commercial pools should have a maximum turnover period of 12 hours (rate of two or more per 24 hours).
- A pool should have a maximum turnover period of two hours (rate of 12 or more per 24 hours) if it:
  - Is designed exclusively for play or leisure (i.e., wave pool, waterfall or river pool).
  - Is equipped to generate moving water features such as waves, rapid currents, sprays or water jets.
  - Has a maximum water depth of 122 cm (48 in) or less.
  - Is a spray pool (a 30 minute turnover is recommended).
- Hot tubs or other therapeutic pools should have a maximum turnover period of 30 minutes (rate of 48 or more per 24 hours).

Where a pool serves a combination of uses (e.g., a water slide catch pool, leisure pool and training pool), the maximum turnover period should be adjusted accordingly to account for changes in the expected bathing and associated pollution loadings.

The water circulation rate affects the size of recirculation equipment and velocities through the main drain. Operationally, higher pool recirculation rates enable more pool water to move through the filters, potentially reducing chlorine demands and improving operational stability. However, higher rates may create suction entrapment hazards. All these factors should be considered when selecting the recirculation rate for the pool, in addition to the maximum turnover periods stated above.

FLOW-THROUGH POOLS

Flow-through pools (including hot springs and natural spas covered under the regulation) should have water added continuously at a design flow rate that would achieve the same turnover period as a

recirculating pool (see the "Design Flow Rate" section above). The quality of water added must be approved by the health authority and maintained to meet requirements of the regulations.

MULTIPLE POOLS

All pools should be on separate and independent circulation systems. This prevents cross-contamination between pools, reduces the likelihood of rapid water-level fluctuations when bather loads in adjacent pools suddenly change, and allows individual pools to be isolated, closed and maintained without affecting the operation of other pools in the complex. Independent recirculation systems are also beneficial for the control and maintenance of pool water quality and chemistry.

Where the piping configuration enables water from one pool to be used to fill another, the piping should:

- Enable pool water to fill a hot tub, but not vice versa.
- Not interfere with the ability of the independent recirculation systems to function continuously.

WATER VELOCITY

The maximum velocity of water through any drains or suction fittings must be 46 cm/sec (1.5 ft/sec) or less at the design flow rate, in accordance with Section 10(2)(k) of the Pool Regulation.

7.3 CIRCULATION EQUIPMENT

PIPING

All piping should be designed to minimize friction losses and to carry the required quantity of water at a velocity not to exceed:

- 3 m/sec (10 ft/sec) in supply pipes
- 1.82 m/sec (6 ft/sec) in suction pipes

Piping must conform to the requirements of the B.C. Plumbing Code (current edition) and should be of nontoxic material, resistant to corrosion by pool water, able to withstand operating pressures and installed according to the manufacturer's recommendations. Piping should be securely mounted and routed away from high-traffic areas to minimize the risk of breakage.

Piping related to pool operation should be properly identified through a standard system of colour coding, flow directional arrows and function labeling. Pipes may also have labeling requirements as part of a WHMIS program. Refer to the Occupational Health and Safety Regulation for details.

PUMPS

Pumps should be either self priming or located below the level of the pool. The pump should be protected from damage and securely mounted on a housekeeping pad.

7.4 CROSS-CONNECTION CONTROL

Cross-connection control ensures that potential contamination in a pool does not impact the potable water supply or water quality in another pool. Cross-connection control measures in a pool should include:

- Approved backflow preventers on connections to a potable water supply, including:
  - Pool fill lines, including automatic pool fillers.
  - Hose bibs.
- The ability to isolate a pool's circulation system from another pool's circulation system.
- The pool filter backwash pipe should discharge to waste through an air gap that is at least twice the inside diameter of the backwash pipe.

Notwithstanding any of the above, the pool must comply with any other requirements of the *Drinking Water Protection Act* and the B.C. Building Code.

EQUIPMENT ROOM WATER SUPPLY

The water supply into the equipment room should be equipped with a Reduced Pressure Backflow Prevention Assembly (RPBA). The AWWA Canadian Cross Connection Control Manual (Edition #1, 2007), Section IV, Table I assigns pools a moderate hazard rating. The table further notes that where a higher hazard exists (due to toxicity or health hazard), additional area protection with an RPBA is required. The potential for a health hazard exists should there be a fecal accident in the pool basin. Such a situation would increase the hazard rating for this application; therefore an RPBA is strongly advised.

7.5 WINTER HAZARDS

Pools operating in conditions where there is a possibility of water freezing on the deck or edge of the pool should provide an effective method of heating the deck, access walkways and stairs to prevent ice formation and maintain an ice-free condition.

Consideration should be given to preventing ice formation on pool features to which pool users have access, such as water slides.

Pools that are shut down in the winter may require special design consideration and maintenance procedures to prevent damage to the pool during winter.

8 POOL BASIN EQUIPMENT

8.1 POOL INLETS

Pool inlets should be:

- Submerged at least 61 cm (2 ft) below the average operating level.
- Placed as near to the pool floor as possible if the pool water depth is less than 61 cm (2 ft).
- Floor-level type if the pool is a beach entry or zero-depth pool.

- Located to produce, in so far as possible, a uniform circulation of water and maintain a uniform disinfectant concentration throughout the entire pool.
- Spaced at least 1.5 m (5 ft) away from any skimmer, where possible.

INLET FITTINGS

Inlet fittings should:

- Be of a type whereby the rate of flow and directional angle can be adjusted to improve circulation.
- Be placed in the pool wall and spaced no more than 9 m (30 ft) apart measured from the perimeter of the pool or one fitting for each 45,460 L (12,000 U.S. gallons) of pool volume, whichever is more.

FLOOR INLETS

Where pool sidewalls are more than 13.4 m (44 ft) apart, floor inlets should be used. If floor inlets are used, the inlets should be:

- At least equal in quantity to the number of wall inlets calculated.
- Arranged to carry surface water to the gutters or skimmers.

8.2 GUTTERS AND SKIMMERS

Pool gutters and skimmers should be designed to collect 100% of the pool design flow rate. Section 10(2)(j) of the Pool Regulation requires that at least 50% of the design flow passes through gutters and skimmers to increase the cleansing action on the water surface and reduce suction at the main drain(s).

A flow meter should be installed in either the main drain line or gutter/skimmer line to determine flow rates through the main drain and the proportion of recirculation flow through the gutters/skimmers.

GUTTERS

Gutters commonly used in pools include raised-edge (conventional), deck-level and roll-out gutters. Generally, gutters should extend along the entire perimeter of pools having a surface area of more than 170 m^2 (1,830 sq ft).

Gutters should be designed:

- To rapidly remove surface water at a rate equal to or greater than the pool design flow rate.
- To prevent the gutters from becoming flooded.
- With an interior of not less than 7.6 cm (3 in) wide and 7.6 cm (3 in) deep.
- To prevent entrance or entrapment of bathers' arms or legs.
- To provide easy access for cleaning.
- To provide gutter drains at intervals of not more than 4.6 m (15 ft) and at least 5 cm (2 in) in diameter.
- To provide a fingerhold (bull nose at the pool edge) or handhold so patrons can grab the pool edge.

Raised edge (conventional) gutters should be designed:

- So that the opening into the gutter beneath the coping or deck is not less than 10 cm (4 in) and the interior of the gutter is not less than 7.6 cm (3 in) wide and 7.6 cm (3 in) deep.
- To serve as a handhold so that their edges or lips are rounded and not thicker than 6.4 cm (2½ in) for the top 5 cm (2 in).
- To extend along the entire perimeter of the pool except at steps and recessed ladders.

For deck-level and roll-out gutters, refer to the design guidelines provided in section 3.2.

SKIMMERS

Skimmers may be used in place of gutters to remove surface water from a pool if the pool has a surface area of 170 m^2 (1,830 sq ft) or less.

The number of skimmers a pool should have is the greater of:

- The number calculated at the rate of one skimmer for each 42 m^2 (452 sq ft) of pool surface area or portion thereof.
- The equivalent number calculated based on 4.5 to 7.5 litres/min of design flow per cm of weir (3 to 5 U.S. gallons per minute design flow per inch).
- One skimmer if the design flow rate is less than 114 liters/min (36 U.S. gallons per minute).

Each skimmer should:

- Have a means to regulate the flow of water through it.
- Have a weir.
- Have a lid vented to the pool deck.
- Be positioned to remove surface water from the pool.
- Have valves separate from the rest of the circulation system in the mechanical room.
- Have equalizer lines that connect to the main drain piping, rather than terminating in the pool basin (suction hazard).

BEACH-LIKE EDGE POOLS

For beach-like edge pools with a continuous gutter along the entire length of the beach-like edge and flush with the pool floor, skimmers can be used instead of gutters between the continuous floor gutter and the point where the water reaches a depth of 91 cm (3 ft). Enough skimmers should be provided to achieve a theoretical turnover period of less than one hour in the area to which the skimmers relate.

8.3 MAIN DRAIN AND SUCTION ENTRAPMENT HAZARDS

The main drain induces water circulation in the deeper part of a pool, draws water into the circulation system for filtration, and is used to empty a pool. A poorly or inadequately designed, installed or maintained main drain and/or drain cover are potential suction hazards.

Suction hazards in pools have led to cases of fatal limb entrapment, hair entanglement, and/or evisceration. Poorly designed or malfunctioning main drain outlets can cause suction strong enough to entrap body parts or hair, causing a bather's head to be held under water, potentially causing serious injury and/or death. Drowning deaths have also occurred after the body or a limb has been held against a

drain by suction of the circulation pump. Any open drain or flat grating that the body can cover completely, combined with a plumbing layout that allows a build-up of suction if the drain is blocked, can result in this kind of hazard.

In the United States, deaths due to pool entrapment have led to the enactment of the *Virginia Graeme Baker Pool and Spa Safety Act (VGBPSSA).* The act outlines provisions to minimize the risk of entrapment, including vacuum covers, pool barriers and main drain requirements. While the *VGBPSSA* is not law in B.C., the Ministry of Health supports the efforts to reduce suction hazards.

Strategies to prevent accidents from suction entrapment should address five areas:

- Pool design.
- Pool maintenance (see *B.C. Guidelines for Pool Operation*).
- Training of pool personnel (see *B.C. Guidelines for Pool Operation*).
- Emergency procedures (see *Pool Safety Plan Guide for Pool Operators*[13]).
- Public awareness (see *Pool Safety Plan Guide for Pool Operators*).

This section of the guidelines addresses pool design aspects for minimizing suction entrapment risks, including pool main drain, main drain cover, piping, and equalization fittings. For spray pools and other zero-depth aquatic areas, refer to the spray pool guidelines in section 11.4. Operational aspects are covered in the *B.C. Guidelines for Pool Operation*.

POOL MAIN DRAIN

The pool main drain should:

- Be at the deepest point in the pool to permit the pool to be completely and easily emptied.
- For frame- and grate-type main drains, have a sump depth of at least 1½ pipe diameters to create equal suction velocity across the drain.
- Have each opening covered by a grating that is not readily removable by bathers and precludes the possibility of a body forming a seal against the cover.

To minimize suction and entrapment hazards, it is strongly recommended, as an engineering best practice, that a minimum of two drains be installed in a pool. The drains should be spaced at least 92 cm (36 in) apart so that a body could not cover both simultaneously to create a vacuum. The installation of a second drain splits the suction induced by the pump between two outlets, reducing the suction at a blocked drain.

If it is not possible to install two drains (such as a pool retrofit), all outlet and discharge pipes should be adequately guarded to prevent an adverse suction hazard. Design considerations to minimize suction hazards where two drains are not feasible include:

- Installing a side/vertical mounted suction fitting, as long as the main drain line and suction fitting are interconnected and the velocity through the suction fitting is less than 46 cm/sec (1.5 ft/sec) at the design flow rate.
- Installing onto the main drain line an air line (anti-suction system), supplemental vacuum relief system, or automatic pump shutoff that will relieve the suction if the intake gets blocked.
- Converting the drain plumbing into a gravity drainage system.

[13] http://www.health.gov.bc.ca/protect/pdf/pool-safety-plan.pdf

These devices will only minimize suction risks, not the risk of hair entanglement. Hair entanglement risks are mitigated through proper drain cover design.

POOL MAIN DRAIN COVERS

The *VGBPSSA* requires that drain covers in the U.S. are tested and certified in accordance to ANSI/APSP-16-2011: Standard Suction Fittings for Use in Swimming Pools, Wading Pools, Spas and Hot Tubs. There are a number of *VGBPSSA*-compliant drain covers on the market, but it is important to note that compliance with the *VGBPSSA* requirements does not ensure compliance with the Pool Regulation. Flow rates through any drain cannot exceed 46 cm/sec (1.5 ft/sec) at the design flow rate. (For pools with more than one main drain, the flow rate calculation should be based on the design flow divided by the number of drains, assuming no blockage).

New or replacement drain covers should have the following properties:

- A flat or low-profile design for pool areas less than 1.5 m (5 ft) in depth, to minimize tripping hazards.
- A grating opening that will not entrap toes, fingers, hair or limbs.
- No sharp corners.

POOL MAIN DRAIN PIPING

The pool main drain piping should:

- Be separately valved from the gutters or skimmers and discharge into the circulation pump suction, surge tank or an approved drain.
- Have a capacity equal to 100% of the design flow rate.

HYDROSTATIC RELIEF VALVE REQUIREMENT

Pools that are not designed to resist hydraulic uplift should be provided with a hydrostatic relief valve.

DRAIN CONNECTION TO CIRCULATION SYSTEM

All pools with overflow gutter systems should have all overflow gutters connected to the circulation system through a properly designed surge tank.

EQUALIZATION FITTINGS

Skimmer equalization fittings may also pose as suction hazards. Measures to minimize suction hazards from these fittings include the following:

- Excluding equalization fittings from the pool basin (below the water line) in new pool designs.
- All skimmer equalizer lines should be routed through the main drain piping rather than to the pool basin.
- Existing skimmer equalizer lines that end below the water line should be rendered inoperable to prevent an entrapment hazard. (Contact your health authority to discuss options.)

REFERENCES

Guidelines for Entrapment Hazards: Making Pools and Spas Safer, U.S. Consumer Product Safety Commission, March 2005. Washington, D.C. 2007

Virginia Graeme Baker Pool and Spa Safety Act, Title 14 of the *U.S. Energy Independence and Security Act* (2007).

8.4 VACUUM CLEANING SYSTEMS

Where a pool vacuum-cleaning system is installed, it should be capable of cleaning the entire pool floor. Vacuum cleaning systems should be designed so as to not create a suction or entrapment hazard when not in use. In order to minimize suction and entrapment hazards, the use of portable systems or robotic cleaners is preferred.

If the vacuum cleaning system is an integral part of the circulation system, connections should be located in the walls of the pool at least 20 cm (8 in) below the water level. To minimize the risk of an entrapment or suction hazard to pool patrons, a cap or cover is required for the suction fitting to the vacuum cleaning system. The cap should be manufactured in compliance with IAPMO SPS 4 (current edition) or equivalent.

If the vacuum cleaning system is an on-deck pump, the outlet should go to the circulation system or to waste. If fecal matter is being vacuumed, however, the outlet should only go to waste.

Electrical outlets for vacuum cleaning systems shall be installed in accordance with the B.C. Electrical Code (current edition).

8.5 OTHER ENTRAPMENT HAZARDS

Entrapment is any condition that impedes withdrawal of a body or body part that has penetrated an opening. While suction may be a major cause of entrapment, there are other situations where a person may become trapped resulting in risk of injury, strangulation or drowning. This may happen where younger children may not have the necessary cognitive ability or motor skills to extricate themselves, especially if frightened or panicked.

Examples of features that may pose a risk of entrapment and require special attention:

- moveable bulkheads
- movable floors
- play equipment
- water features
- portable stairs
- lifts
- skimmers in lazy rivers that may trap hands
- exits of slides/water slides

Much of this risk can be eliminated through careful design to minimize entrapment hazards. The equipment should be used only for the purpose for which it is designed.

8.6 SURGE CAPACITY

Surge capacity in a pool is achieved through free-board in pools with skimmers. In pools using gutters, the gutter, transit piping and the surge tank all contribute to the volume of surge capacity in the pool. Surge capacity increases the pool's ability to maintain a steady water level in response to sudden changes in pool use. This ensures that gutters, skimmers, and water intakes remain below the surface to the water to prevent loss of effective filtration or other circulation problems.

The surge capacity of pools should be designed for the maximum bathing load. For all pools equipped with gutters, 84 L (3 ft^3) of surge capacity per bather should be provided.

SURGE TANKS

A surge tank should be installed in pools using gutters. The surge tank should have:

- A working capacity of at least 57 L (2 ft3) per bather, based on the maximum bathing load.
- A working capacity exclusive of pipe or channel capacity required for recirculation rates. The balance of the surge capacity may be provided by pool gutters and piping capacity.
- "T" fittings vented to the atmosphere on a suction pipes to reduce the risk of a suction hazard to workers conducting surge tank maintenance.
- Hatches with a locking mechanism to prevent bather entry, if located in bathing areas.
- Hatches that are slip-resistant and not a tripping hazard, if located on the pool deck.
- Designed to reduce the risk of accidental entry.

For more information on confined spaces in surge tanks, contact WorkSafe BC.

8.7 MAXIMUM BATHING LOAD

POOLS

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 m^2 where the water depth is greater than 1.5 m, and
Where S = area of pool in m^2 where the water depth is less than 1.5 m.

HOT TUBS

Bather load for hot tubs may be determined based on increments of 60 cm (2 ft) of seating per person.

SPRAY POOLS

The bather load for spray pools should be 1 person per m^2 of spray pad surface.

9 POOL WATER TREATMENT

9.1 FILTRATION

Filtration is an essential part of the circulation system as it removes dirt, oils and debris from the water, which helps maintain safe and desirable water quality. Effective filtration will also reduce chlorine demands, helping to maintain low levels of combined chlorine in the pool water.

FILTER PIPING

The filter piping arrangement should be as simple as possible to accomplish the filtration and backwashing or cleaning.

The pool filter backwash pipe should discharge to waste through an air gap that is at least twice the inside diameter of the backwash pipe.

FILTER UNITS

The filter units should be:

- Capable of operating at continuous design flow rate.
- Equipped with pressure, vacuum or compound gauges as required to indicate the condition of the filter.

In vacuum-type filter installations where the circulating pump is 2 horsepower or more, an adequate automatic high vacuum shut off should be provided to prevent damage to the pump by cavitation.

CERTIFICATION
All pool and filter room equipment, and components, should be NSF- or CSA-certified.

SAND FILTERS

Sand filters should be designed for a maximum flow rate of approximately 600 L/min/m^2 (15 USgpm/ft^2) of filter area.

DIATOMACEOUS EARTH FILTERS

Diatomaceous earth (DE) filters should be designed for a maximum flow rate of 60 L/min/m^2 (1.5 USgpm/ft^2) of filter area. For regenerative-type DE filters, the flow rate should follow the manufacturer's recommendations.

On nonregenerative-type DE filters, backwashing releases the DE into the backwash water. The facility receiving the backwash water, whether through a permit or not, should be notified of the presence of DE in the wastewater, as it may affect downstream treatment.

CARTRIDGE FILTERS

Cartridge-type filters should not be used in public or commercial pools.

9.2 DISINFECTION AND OTHER CHEMICALS

POOL DISINFECTION EQUIPMENT

Pool disinfection equipment should:

- Be automatic.
- Be easily adjustable to maintain recommended disinfectant residual levels during periods of both high and low use.
- Be properly sized for the pool and design flow rate.
- Have sufficient capacity to continuously feed free chlorine (or equivalent) into the circulation system at levels of up to (based on the design flow rate):
  - 3 mg/L for indoor pools
  - 8 mg/L for outdoor pools
  - 5 mg/L for indoor hot tubs
  - 8 mg/L for outdoor hot tubs

DISINFECTANTS

Disinfectants inactivate pathogens in the recirculated water, provide a disinfectant residual in the pool water and minimize the buildup of organic

AUTOMATIC DISINFECTION

Acceptable forms of automatic disinfection include:

- chlorine gas injection
- sodium hypochlorite injection
- adjustable erosion feeders

Disinfection methods that are not considered to be automatic include:

- disinfection pucks in skimmer baskets and recirculation pump prefilters
- manual application
- floating erosion feeders common in residential hot tubs

Erosion feeders utilizing trichloroisocyanuric acid (Tri-chlor) tablets should only be used in outdoor pools, because the tablets contain cyanuric acid. Use of Tri-chlor in indoor pools can lead to excess cyanuric acid in pool water resulting in a reduction in disinfection effectiveness. Such a buildup can be managed through diluting pools with make-up water.

OTHER CHEMICALS

Automatic feeders that add other chemicals should be sized to provide an appropriate rate of feed for the demand of the facility.

9.3 GAS CHLORINATION

Chlorine disinfectant is available in a number of forms, including chlorine gas, liquid sodium hypochlorite, and onsite-generated sodium hypochlorite. Many pools use chlorine gas as a disinfectant. When used as intended, this provides an effective disinfectant; however, a chlorine gas leak can cause serious injury or death.

Proper design of chlorine gas facilities is crucial to managing the potential health and safety risks inherent in the use of this highly reactive gas. Chlorine gas leaks have the potential to harm public health as well as worker safety. The oversight for chlorine gas facilities is a shared responsibility between Worksafe BC, the Ministry of Health and health authorities.

The Worksafe BC Occupational Health and Safety Regulation contains a number of requirements for chlorine gas facilities that must be followed. Many of these requirements are outlined in Worksafe BC's *Chlorine Safe Work Practice Manual*[14] and the PoolSafe BC guideline.[15] The local health authority will also review the design from a public health protection perspective.

9.4 ONSITE CHLORINE GENERATION SYSTEMS (SALT WATER POOLS)

In pools using salt water disinfection systems, salt is added to the pool water. When the salt water passes through an electrolytic cell as part of the circulation treatment system, the salt is converted into sodium hypochlorite. Consequently, salt water systems are still chlorination systems. They should be designed with the same considerations as with more conventional forms of chlorine (gas, liquid sodium hypochlorite, etc.), in addition to technology specific considerations.

Onsite chlorine generation systems should:

- Be certified to NSF 50: Equipment for Swimming Pools, Spas, Hot Tubs and other Recreational Water Facilities.
- Have provisions to ensure continued disinfection (operational controls, equipment spares, back-up chemical dosing system, etc.) in the event of salt water system malfunctions (electronic malfunction, low salt levels, etc.).
- Be adequately sized to maintain the required chlorine residual in the pool at all times.
- Have adequate protection for all equipment components and surfaces in contact with the salt water.
- Meet the manufacturer's requirements for pool water quality parameters, including hardness and temperature.
- Be placed in a location with suitable ventilation to prevent hydrogen gas build-up.

Due to its salt content, the discharge of pool water should also be considered during the design stage. Consult with local authorities early on to determine if the discharge of salt water into the local sewer or receiving environment is permissible or if pretreatment is required.

9.5 UV TREATMENT

Ultraviolet light treatment is often used in pools as a supplementary form of disinfection to reduce chlorine consumption and disinfection byproduct formation or as a means of destroying chloramines. Reduction in the formation of disinfection byproducts can improve indoor air quality within the pool area.

Since UV disinfection cannot impart a residual disinfectant in the water, UV disinfection cannot replace chlorine, chlorine cyanurate, or bromine as primary disinfectants.

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[14] http://www.worksafebc.com/publications/health_and_safety/by_topic/occupational_hygiene/default.asp

[15] http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/poolsafebc.pdf

All UV systems should be certified to NSF Standard 50: Equipment for Swimming Pools, Spas, Hot Tubs and other Recreational Water Facilities. Large flow devices evaluated in accordance with other validation or certification protocols may also be considered.

FOR SUPPLEMENTARY DISINFECTION

UV treatment used as a supplemental form of disinfection should be certified to NSF Standard 50 for either:

- 3 log reduction of *Enterococcus faecium* and *Pseudomonas aeruginosa*; or
- 3 log reduction of *Cryptosporidium*.

FOR CHLORAMINE DESTRUCTION

UV light is effective at destroying chloramines in pool water. The optimal dosage for chloramine destruction is 60 mJ/cm^2 at 280 nm. This wavelength can only be achieved through medium-pressure UV lamps.

9.6 OZONE SYSTEMS

Ozone is commonly used in pools to oxidize organic matter, leading to a reduction in chlorine demand and therefore a reduction in the formation of chlorine disinfection byproducts (combined chlorine). Reduction in the formation of disinfection byproducts can improve indoor air quality in the pool area.

Since ozone dissipates rapidly, it is unable to maintain a residual in the water. For this reason, it cannot replace chlorine, chlorine cyanurate, or bromine as the primary disinfectant.

Protection of workers from ozone-related hazards falls under the jurisdiction of the WorkSafe BC, and designs must consider their requirements. Further information on WorkSafe BC requirements can be found on the WorkSafe BC website.[16]

Ozone systems should be certified to NSF 50 and must conform to WorkSafe BC requirements found in the *Ozone Safe Practices Manual* (BK 47)[17] including:

- ventilation considerations
- destruction of ozone off-gas from contact tanks
- ozone room design requirements

9.7 MEASUREMENT OF CIRCULATION

RATE OF FLOW INDICATOR

A rate of flow indicator should be provided and maintained for each pool to show the rate of pool water circulation. This allows for verification of velocities through drains. The indicator should:

[16] http://www.worksafebc.com

[17] http://www.worksafebc.com/publications/high_resolution_publications/assets/pdf/bk47.pdf

- Be conveniently located for ease of viewing.
- Be calibrated in either litres per minute or U.S. gallons per minute.
- Provide at least 90% accuracy.
- Be capable of flows measuring from 50% to 150% of the design flow rate.
- Not be at risk of plugging.

Rate of flow indicators should be installed on all return lines – including recirculation, water feature, skimmer/gutter, and water slide lines. Where a whirlpool jet pump system is in place, a rate of flow indicator should be located on the jet pump circulation system.

All flow indicators should be installed in accordance with the manufacturer's specifications. The required number of pipe lengths of straight pipe upstream and downstream of the flow indicator should be provided to achieve the stated flow reading precision and accuracy levels.

9.8 EQUIPMENT ROOMS

Equipment rooms must be designed to the B.C. Building Code (current edition). Additionally, equipment rooms should be designed to:

- Permit equipment to be easily installed, inspected, and maintained.
- Allow equipment to be mounted at or above floor level. For example, pumps and/or other electrical equipment should be installed on a minimum 75 mm (3 in) housekeeping pad.
- Provide the manufacturer's recommended maintenance area around equipment (height and floor area). Where the manufacturer does not specify a recommended maintenance area, sufficient space should be provided to dismantle equipment, remove components or contents, perform routine maintenance, and, in some cases, replace equipment.
- Include floors sloped to drains.
- Allow sufficient space for safe storage of auxiliary equipment.

9.9 CHEMICAL STORAGE AREAS

Proper design of chemical storage areas is essential to minimize the risks associated with storing dangerous goods. The B.C. Fire Code details chemical-storage-room design requirements. Aspects of note are outlined in Division B, Section 3.2 of the B.C. Fire Code (2012 version) and include, but are not limited to:

- Clearances (3.2.2.3)
- Storage limits (3.2.7.1)
- Prohibition of open flames or spark producing devices (3.2.7.2)
- Ventilation to prevent build up of gases or chemical fumes (3.2.7.3)
- Separation distances from other chemicals. (Some incompatible goods must not be stored in the same fire compartment.) (3.2.7.6).
- Fire protection and suppression systems (3.2.7.9)
- Spill containment (3.2.7.11 and 3.2.7.17)
- Storage of gas fired appliances (3.2.8.2)
- Storage of compressed gases (3.2.8)

In addition to the storage separation minimums required of the B.C. Fire Code, adequate separation should be provided to minimize the risk of accidental chemical mixing during tank filling and chemical mixing/dilution.

INDIVIDUAL STORAGE REQUIREMENTS

Protection of workers from chemical hazards falls under the jurisdiction of WorkSafe BC, and designs must follow their requirements. Section 5.24: Incompatible Substances, in the *Occupational Health and Safety Regulation* states:

> *Substances which are incompatible must not be stored in a manner that would allow them to mix in the event of container leakage, breakage or other such circumstance.*

Consult the Material Safety Data Sheets (MSDS) for each of the chemicals to be stored to determine incompatible chemicals and individual storage requirements. Further information on WorkSafe BC requirements can be found on the WorkSafe BC website.[18]

RESERVE CONTAINERS

When sizing chemical storage rooms, consideration should be given to providing sufficient storage space for reserve containers of chemicals, especially in remote locations where chemical delivery may be infrequent. Adequate clearance should also be provided for chemical transporting equipment, such as forklifts, where applicable.

SPILL CONTAINMENT

In addition to the spill containment requirements of the B.C. Fire Code, chemical storage tanks should be double walled or separated by concrete enclosures, spill pallets or other spill containment system surrounding each tank. Each spill containment system should have an enclosure capable of containing 110% of the contents of each tank stored within the system.

Where possible, piping containing incompatible chemicals should be routed separately to minimize the potential for chemical reactions due to drips and leaks.

[18] http://www.worksafebc.com

PART FOUR: SPECIAL DESIGN FEATURES

10 POOL EQUIPMENT

10.1 POOL SLIDES

POOL SLIDES EXEMPT UNDER THE ELEVATING DEVICES SAFETY REGULATION

Slides used in a pool environment can include dry slides and water slides. Some dry slides and water slides are regulated under the *Safety Standards Act* – Elevating Devices Safety Regulation (EDSR) by the BC Safety Authority (Section17 and Schedule of the EDSR). Slides exempt from the EDSR are outlined in Section 18(2) as being:

(a) water slides that meet any one of the following criteria:

(i) the height of the slide from the specified water level in the receiving pool to the top of the loading platform sill is 3.05 m or less;

(ii) the length of the flume is 30.5 m or less, with height/run ratio of 0.1 (6°);

(iii) the maximum rider velocity is not greater than 3.6 m/s;

(b) dry slides that do not exceed a height of 4 m;

Pool slides that are exempt from the EDSR fall under the Pool Regulation. For further information on EDSR regulated water slides, refer to section 11.1.

GENERAL REQUIREMENTS

The design and location of slides not regulated by the Elevating Devices Safety Regulation should take into consideration:

- The size of the people who will use the slide.
- The trajectory upon sliding in the water.
- The depth of the water, including slope of the pool basin floor.
- Manufacturer recommended plunge depths.
- Lifeguard visibility/access.
- Proximity of pool sides.

Design consideration may also be given to CSA Z267: *Safety Code for Amusement Rides and Devices* and ASTM F2376: *Standard Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems* (current edition). Slides are to be installed and maintained according to manufacturer's specifications.

SIGNAGE

Slide side signage should be provided indicating:

- One rider at a time.
- Wait until the landing area is clear before entering the slide.

- Slide in the sitting position or on the back only.
- Do not attempt to stop on the slide.
- Leave the plunge area immediately.
- Users of the slide should be of an age and size to manage the slide.

10.2 PLAY EQUIPMENT

Play equipment, such as climbing walls and rope swings, have become a popular part of contemporary recreation facilities. While each piece of play equipment must be evaluated on its own merit, these guidelines outline basic requirements for all play equipment. Play equipment must meet the health authority's approval on the design and location prior to installation. Operational measures to ensure patron safety should be outlined in the pool safety plan (refer to the *B.C. Guidelines for Pool Operation*).

All play equipment should be designed and manufactured according to ASTM F2461 (current edition): *Standard Practice for Manufacture, Construction, Operation, and Maintenance of Aquatic Play Equipment*, or equivalent. Placement of play equipment should ensure that the water depths specified by the manufacturer are met.

ROPE SWINGS

The design and location of rope swings should take into consideration safety and structural concerns. Rope swing designs should:

- Be certified by a structural engineer. When a rope swing is in use, it can create considerable torsional stress on beams above, and the effect of the swing on the structure of the building should be considered.
- Consider the trajectory, pool slope, and potential impact with the pool sides, walls and deck (to prevent users from striking the pool bottom).
- Not conflict with other pool activities (e.g., diving), through the provision of sufficient lateral clearance between the rope swing and other pool use areas.

SELF-INFLATING POOL FEATURES

Self-inflating pool features that have continuous air flow are managed by the B.C. Safety Authority. Self-inflating pool features that do not have continuous air flow should follow the design guidelines outlined below in "Other Play Equipment."

OTHER PLAY EQUIPMENT

There are many variations on play equipment that may be proposed. Examples include zip lines, rolling logs, climbing nets and sealed air inflatables. Play equipment should be designed so that it:

- Has no hard edges or unnecessary protrusions.
- Does not pose an entrapment risk to patrons.
- Is constructed of materials that are easily cleanable, impervious to water and unlikely to promote bacterial growth.
- Does not exert excessive water pressure.
- Is unlikely to result in injury from falling from it.

- Does not interfere with lifeguard visibility or access.

10.3 MOVEABLE BULKHEADS

BULKHEAD DESIGN

Bulkheads should be designed to:

- Sustain design loads.
- Provide a safe and stable platform.
- Not move under the force of tensioned lane lines or swimmers diving off the bulkhead.
- Not interfere with pool circulation (through the provision of gaps on the side of the bulkhead, flow through the bulkhead, gaps in the bottom, etc.).
- Be fabricated of materials tolerant to exposure to a pool environment.
- Provide a continuous handhold or finger grip on both sides of the bulkhead.
- Be of sufficient width for intended use, typically at least 1.2 m (4 ft) in width.
- Have no sharp edges on the structure.
- Have slip-resistant gratings on deck and side walls that meet the pool basin colour and pattern guidelines.

MOVEABLE BULKHEADS
Moveable bulkheads split a pool's water area into two or more sections, giving a pool operator the flexibility to program different activities in the separate pools. They are also used to adjust pools to the correct lane length for competitive events and provide a platform for starting blocks.

Designers of bulkheads intended for use in competitive events should refer to Section FR 2.14 of the FINA Facility Rules[19] for additional design considerations.

ENTRAPMENT HAZARDS

As moveable structures, bulkheads can pose as an entrapment hazard. Bulkheads should have:

- No opening that constitutes a tripping or entrapment hazard.
- A fully encased exterior that prevents swimmer entry into the structure.

BULKHEAD LOCATION

Bulkheads should be designed to:

- Span the entire width of the pool.
- Maintain entrances and exits to the reduced pools.

[19] http://www.fina.org/H2O/index.php?option=com_content&view=category&id=88:facilities-rules&Itemid=184&layout=default

ERGONOMIC DESIGN

Moving bulkheads pose ergonomic hazards to pool staff. Bulkhead design must meet the requirements for control of ergonomic hazards as outlined in Part 4 of the Occupational Health and Safety Regulation. Contact Worksafe BC for more information on ergonomic design.

10.4 MOVEABLE FLOORS

MOVEABLE FLOOR DESIGN

Moveable floors should be designed to:

- Span the entire width of the pool.
- Eliminate the possibility of entrapment hazards by preventing pool patron access to the underside of the pool floor through the use of a tight-fitting barrier between the moveable floor and pool floor.
- Sustain design loads including land-based activities (if applicable).
- Allow for pool circulation (through the provision of gaps in the floor, sides, configuration of gutters, etc.).
- Have pool inlet fittings installed under the moveable floor to allow for circulation of water.
- Be made of enduring materials tolerant to exposure to a pool environment.
- Have a slip-resistant surface that meets the guidelines on:
  - Deck finishes. See section 3.2.
  - Pool basin surfaces and finishes. See section 4.1.
- Have floor openings and gratings that do not pose a suction or entrapment hazard. See section 8.3.
- Have floor positions and openings that do not cause toe or finger entrapment (approximately 8 mm (3/8 in)) between the floor and pool wall or any pool steps, stairs or installed pool features.
- Not sink or float during a control system failure or power outage.
- Maintain the use of required pool entrance and exits without causing pinching and entrapment hazards.
- Have floor drives that are fully enclosed and do not pose an entrapment hazard to pool patrons.

MOVEABLE FLOORS

Moveable floors allow for a pool, or section of pool, to have an alterable depth, giving the pool operator the flexibility to change the pool depth to accommodate a variety of programming uses. In some cases, moveable floors can cover the pool entirely, allowing the pool space to be used for

MOVEABLE FLOOR CONTROLS

Moveable floors should be adjusted through a control panel that:

- Provides an audible alarm in emergency situations.
- Is tamper proof.
- Is certified for use in wet areas per the B.C. Electrical Code.
- Is adequately enclosed for a pool environment.
- Is located in an area that provides the operator a full view of the movable floor.
- Automatically adjusts pool depth displays.

VARIABLE DEPTH CONSIDERATIONS

Since pool depths change depending on the position of the moveable floor, depth-related design aspects that are likely to be affected include:

- Pool depth displays, which should follow the depth marking guidelines in section 4.5.
- Provisions to prevent diving, water slide, play equipment, and slide usage when the pool depth is less than the safe depths for these activities.

11 SPECIALTY POOLS

11.1 WATER SLIDES

WATER SLIDES UNDER THE EDSR

Water slides are regulated under the *Safety Standards Act* – Elevating Devices Safety Regulation (EDSR) by the BC Safety Authority (s17 and Schedule of the EDSR). The BC Safety Authority accepts design filings and issues permits for installation and operation of water slides regulated by the EDSR. For further information, visit the BC Safety Authority website at http://www.safetyauthority.ca/.

Water slides that do not discharge into a pool (such as slides with flumes) fall under the EDSR. A review and inspection of the circulation systems should still be completed for these types of slides. Health authorities may be able, through a letter of understanding, to assist in this capacity.

Water slide landing pools must meet the water quality requirements of the Pool Regulation. Water slide circulation systems fall under the jurisdiction of the Pool Regulation with respect to suction and entrapment hazards.

WATER SLIDES EXEMPT FROM THE ELEVATING DEVICES SAFETY REGULATION

According to Section 18(2) of the EDSR, water slides are exempt from the EDSR if:

- The height of the slide from the specified water level in the receiving pool to the top of the loading platform sill is 3.05 m or less.
- The length of the flume is 30.5 m or less, with height/run ratio of 0.1 (6 degrees) or less; and/or
- The maximum rider velocity is not greater than 3.6 m/s.

Water slides that are exempt from the EDSR should be designed to the guidelines provided in section 10.1.

GENERAL

The following should be considered in the design of water slides:

- The bottom of the slide should be visible from the slider's entry point at the top of the slide. The use of cameras or controlled access may be considered in achieving this objective.
- Where two deceleration flumes are side by side, there should be at least 1.2 m (4 ft) of deck space between flumes so bathers may exit the pool in an emergency.

- Water drawn from the pool circulation system for the water slide should be accounted for in the pool recirculation design. Also, in built-in wall drains, a full vault design that can be vented to the pool deck and surrounding pool environment (to break any suction) should be considered.

11.2 WAVE POOLS

Wave pools should have:

- A warning mechanism providing an audible and visual warning prior to wave generation to allow bathers an opportunity to leave the pool or move to shallower water.
- A beach or zero-depth end to diminish the wave and allow for safe exit.
- Wave chamber bars constructed of stainless steel or similar acceptable material. Rotating wave chamber bars should be spaced to reduce the risk of entrapment.
- Where there is a wave chamber in a pool basin, a rope, lane line or other measures located 1.5 m (5 ft) from the wave chamber bars to discourage public access and prevent entrapment.
- Guard rails on decks at the deep end around wave chamber walls that should extend 1 m (3.2 ft) beyond the wave generator, and may be extended until the free board is less than 500 mm (22 in) at mean water level.
- Air blowers (where used) contained in a separate room that is constructed of acoustic limiting material to reduce noise levels.
- Regular inspections of wave chamber bars for structural integrity.
- Ladders or steps in the deep end for exiting the pool. The ladders or steps should be recessed into the wall.
- An emergency shut-off in the immediate area of the pool.
- A maximum turnover period of two hours or less.
- A wave amplitude not exceeding the pool freeboard or flood decks.

SURFING RIDES

Surfing rides are not considered to be a subset of wave pools. Contact the BC Safety Authority (also notify your health authority) for information on design

11.3 WADING POOLS

To be considered a wading pool in the Pool Regulation, the maximum depth of water must be less than 61 cm.

POOL AREA

Wading pools should:

- Be free of obstructions.
- Have a uniform floor with a maximum slope of 1 in 15 and a minimum slope of 1 in 50.
- Be entirely surrounded by a walkway at least 1.2 m (4 ft) wide that falls away from the pool or basin edge at a uniform slope of not less than 1 in 50.

DIAPERS

While swimming diapers can minimize the release of fecal matter into the pool, none are leak proof.

WATER QUALITY

Wading pools must meet the water quality requirements in the Pool Regulation. Turnover rates for recirculating wading pools should not exceed two hours. The health authority may require potable water as defined in the *Drinking Water Protection Act* be used in a wading pool.

FITTINGS

Fittings in wading pools using circulation systems should be located to produce uniform water circulation throughout the pool. They should be secured to provide protection from suction and pressure hazards.

NO CROSS-CONNECTIONS

There should be no cross-connections between a wading pool and any potable water supply, water circulation system of any pool or sewer.

WADING POOL FENCING

Wading pools must have a fence or other barrier with controlled access surrounding the pool and the walkways to prevent the easy access of nonusers and pets. This requirement does not apply to wading pools that are drained and left empty overnight.

WADING POOL FILLING

New wading pools should have a recirculation system that includes automatic disinfection. These pools may be left filled overnight, but must have a security fence and lockable gate.

Existing wading pools may not have recirculation systems. These fill-and-draw-style wading pools should be filled with potable water each day it is used, operated to maintain the water quality requirements of the Pool Regulation, drained before dark and left empty overnight. Consult your health authority about disinfectants and minimum draining intervals for wading pools during the daytime.

11.4 SPRAY POOLS

The following design guidelines (except fittings and cross-connection guidelines) apply to zero-depth spray pools only. Where spray features are incorporated into a wading pool, refer to the wading pool design guidelines in section 11.3.

SPRAY DECK

The spray deck should:

- Be made of a durable material that is impervious to moisture and retains a texture that is slip-resistant and causes no discomfort to bare feet.
- Not allow for the accumulation of standing water.
- Drain by gravity into flat or low-profile drains.
- Be free of obstructions.

- Have a floor with a maximum slope of 1 in 15 and a minimum slope of 1 in 50.
- Be entirely surrounded by:
  - An overspray area suitably sized for the spray equipment and local wind conditions (2.4 m (8 ft) to 3.0 m (10 ft) recommended).
  - A walkway at least 1.20 m (4 ft) wide that falls away from the spray pad edge at a minimum uniform slope of 1 in 50.

WATER QUALITY

Spray pools may be designed to use a continuous supply of potable water that drains to waste or designed as a recirculating system. The Pool Regulation requires water used in drain-to-waste-type spray parks to be of a quality acceptable to a health officer. Recirculating spray pool water quality considerations are outlined below.

Where spray features are located within a pool of water, such as a wading pool, the guidelines for wading pools should be followed.

RECIRCULATING SPRAY POOLS

Recirculating spray pools must meet the water quality requirements outlined in the Pool Regulation. The health authority may require potable water as defined in the *Drinking Water Protection Act* be used in a recirculating spray pool. Additional water quality design considerations are outlined below.

OUTBREAK!

Spray pools that collect water and recirculate it have been associated with large communicable disease outbreaks from poor water treatment. In the absence of using only potable water, there should be full water treatment, including filtration, UV disinfection,

ULTRAVIOLET LIGHT

Ultraviolet (UV) light disinfection should be provided to manage *Cryptosporidium* risks. The UV system should:

- Deliver a dosage capable of achieving 3-log removal of *Cryptosporidium* (through NSF 55A or NSF 50 certification, or equivalent).
- Be placed upstream of the chlorination system since UV destroys chlorine – after UV disinfection, a portion of the flow is split, chlorinated and returned to the treatment tank while the remainder is sent directly to the spray pad/features.
- Be located such that UV disinfected water is fed directly to the spray pad/features.
- Have a light intensity sensor that will sound an alarm and shut down the UV reactor when the validated dosage cannot be delivered.
- Be linked (interlocked) with the spray feature pump such that the spray features do not operate when the validated UV dosage cannot be delivered.
- Have the ability to be turned off independent of the recirculation system (through controls, not only manual shutdown) when the spray pad features are not in operation.

TREATMENT TANK

A treatment tank acts as the reserve of water that supplies both the spray features and the recirculating system. The water holding tank for the pool should:

- Be constructed of corrosion-resistant, inert, nontoxic and watertight material.
- Be as large as possible to improve dilution effects and improve operational stability (15.1 m^3 (4000 U.S. gallons) minimum recommended).
- Have an automated fresh water make-up connection with an air gap or reduced pressure assembly (not directly connected).
- Have a sufficient active volume to continuously supply the filtration system and spray features.
- Be accessible for inspection and cleaning.
- Have an overflow to wastewater piping and be capable of completely draining with at least one main drain at the deepest point.
- Have a means of preventing debris from collecting in the tank, such as an upstream screen or trash tank.
- Have an adequate number of treatment tank inlets and outlets spaced in a manner that encourages complete mixing and circulation in the treatment tank. Baffling may help achieve this.

RECIRCULATION SYSTEM

Other components of the recirculation system include the recirculation pumps, filters, and chlorination system. Design considerations for this equipment are provided elsewhere in this document. Additional considerations for the recirculation system include:

- Turnover rates should not exceed two hours (30 minute turnover recommended).
- The recirculation system design flow rate should be at least 1/3 of the spray feature design rate. A flow of 1/2 the spray feature rate is recommended.
- A bypass-to-waste valve that allows drainage collected off the spray pad outside operating hours and during daily cleaning and flushing to drain to waste.
- A flow meter to measure flow to filter and backwash flow. See section 9.7 for flow meter requirements.

SIGNAGE

Signage should be provided to indicate to patrons that the water discharged by the spray features is not potable.

USER FACILITIES

User facilities help discourage the use of spray pool features for activities that could pose health hazards, especially for spray pools using recirculated water. Spray pools should include user facilities in the vicinity of the pool that consist of:

- Drinking water fountains to discourage patrons from drinking water from the spray features.
- Washrooms, including diaper-changing facilities.

FITTINGS

Above-ground fittings in the spray pad area of spray pools should:

- Not pose a tripping hazard – they should be flush-mounted or higher than 90 cm (3 ft).
- Not pose a hazard to users from water velocities or pressures exiting a spray feature.
- Not be climbable by small children.
- Be secured and configured to provide protection from suction hazards. See section 8.3 for details.

NO CROSS-CONNECTIONS

There should be no cross-connections between a spray pool and any potable water supply, the water circulation system of any pool, or any sewer.

11.5 VANISHING-EDGE POOLS

GEOTECHNICAL ASSESSMENT

Although not included in the construction permit review completed by the health authority, vanishing-edge pool designs should be reviewed by an individual competent in geotechnical engineering, to assess site suitability in cases where slope stability could be an issue.

GENERAL

Vanishing-edge pool designs should include:

- Treatment equipment that will condition water from the main pool to meet the water quality requirements outlined in the regulation.
- A separate recirculation system for the vanishing edge independent of the pool recirculation system.
- Back-siphoning protection between the main pool and catch basin.

WEIR EDGE

The weir edge creates the dramatic look characteristic of vanishing-edge pools, but also can create health hazards if not properly designed. Weir edges should have:

- A minimum width of 25 cm (10 in).
- No more than 1.5 m (5 ft) of water depth on the pool side of the edge.
- A slip-resistant surface with the nose-edging in a contrasting colour.
- A “no walking” inscription in a contrasting colour of at least 10 cm (4 in) high.

CATCH BASINS/GUTTERS

Water cascading over the weir edge is collected in a catch basin (also called a gutter). Careful design of the catch basin is necessary to prevent overflows. Catch basins should:

- Be set a maximum of 0.46 m (18 in) below the elevation of the weir.

- Be grated to allow for emergency access to the pool.
- Have a minimum of two outlets that follow the guidelines on main drain and suction entrapment. See section 8.3.
- Have dimensions, drain openings and piping of sufficient size to prevent the catch basin from flooding.
- Have an overflow line if the catch basin volume contributes to the surge capacity of the pool.

PERIMETER DECK

Vanishing-edge pools, like all pools, should have a deck around the perimeter of the pool to allow for emergency access. To accommodate the vanishing edge, these pools should provide a minimum of:

- 1.2 m (4 ft) of decking around the pool, except at the weir edge.
- 1.2 m (4 ft) of decking at the catch basin level.

SURGE TANK VOLUME

The surge tank captures water that is sent over the weir edge due to bather displacement, water from water features and edge walls (transient volume), rainfall, wind-blown water and such. Appropriate sizing of the surge tank and vanishing-edge recirculation pump are crucial in achieving the vanishing-edge effect. Improperly sized surge tanks can lead to catch basin overflows and the loss of the vanishing-edge effect until the lost water is replenished.

Vanishing-edge pool surge tanks should:

- Provide a minimum surge capacity of 85 L (3 ft^3) per bather.
- Provide the entire surge capacity alone, or in combination with the catch basin.
- Have a surge tank overflow line that is below the flood rim on the catch basin.

POOL ENCLOSURE

To prevent accidental falls and unauthorized entry in the pool area, vanishing-edge pools should have an enclosure around the entire pool (main pool and catch basin), following the design guidelines outlined in section 3.1.

APPENDIX A: GLOSSARY OF TERMS

Backflow: The backing up of water through a pipe in the direction opposite to normal flow.

Backwash: A method of cleaning sand or diatomaceous earth filters. It involves reversal of water flow through the filter, with the collected dirt and debris being sent to the waste port.

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

Canadian Electrical Code: A standard published by the Canadian Standards Association pertaining to the installation and maintenance of electrical equipment in Canada.

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

Construction: Includes the design, installation, repair, renovation and alteration of a pool.

Cove: The curving transition from the vertical wall to the horizontal floor, at the bottom of a pool wall.

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.

Design Flow Rate: The quantity of water flowing past a designated point within a specified time, such as the number of litres flowing past a point in one minute.

Diatomaceous Earth Filter: A filter tank containing fabric-covered grids that hold the diatomaceous earth powder up against the flow of the water.

Entrapment Hazard: A fixture that can hold a body or body part (e.g., hands, feet, hair, and torso) against it in a manner the person cannot easily extricate him/herself.

Filter: Equipment used for filtering dust and other fine debris from the pool water. Filtering agents include diatomaceous earth filters, silica sand and cloth cartridges.

Filtration: The process of passing pool water through the filter medium to remove dirt and debris particles.

Ground Fault Circuit Interrupters: A device that protects a circuit from branching off by de-energizing the path of electricity very quickly when it senses current loss.

Gutter: An overflow trough at the edge of the pool through which floating debris, oil and other "lighter-than-water" substances flow. Pools with gutters usually do not have skimmers.

Heating, Ventilation and Air Conditioning (HVAC) System: Technology designed for indoor environmental comfort. It is important in the design of medium-to-large industrial and office buildings such as pools – where safe and healthy building conditions are regulated with temperature and humidity, as well as "fresh air" from outdoors.

Hose Bib: The valve in a water line where a hose is connected.

Hydrostatic Relief Valve: A spring-loaded plug normally situated in the main-drain sump. It is designed to open if the water pressure under the pool is greater than the water pressure within the pool. A relief valve reduces the possibility of an empty pool lifting out of the ground.

Lap Pool: Pool for people swimming laps. Lap pools tend to be long and narrow, usually over 15 metres long.

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.

Main Drain: A plumbing fitting installed at the deepest part of the pool. It is not a drain, such as a drain on a kitchen sink, but usually connects to the pump for circulation and filtration.

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 data sheet.

Pool Inlets: Inlets that return filtered, heated, and chemically treated water back to the pool. Inlets provide strong jets of water and are most often located on pool walls, although in some pools they are located on the bottom.

Pump: A mechanical device that causes hydraulic flow and pressure for filtration, heating and circulation of pool/spa water. Typically, a centrifugal pump is used for pools, spas and hot tubs.

Rate of Flow Indicator: A device that measures pressure differential across a calibrated orifice and indicates the rate of flow at that point.

Sand Filter: A filter that operates on the basis of depth filtration: dirt is driven through the sand bed and trapped in minute spaces between the particles of sand.

Skimmer: A box-like device installed through the wall of the pool or spa connected to the suction line of the pump that draws water and floating debris into the skimmer from the surface.

Skimmer Basket: A removable, slotted basket or strainer placed in the skimmer on the suction side of the pump, which is designed to trap floating debris in the water flow from the surface without causing much flow restriction.

Suction Hazard: Any fixture that can impart a suction pressure strong enough to draw or hold a body or body part (e.g. hands and feet) against an opening. In pools, a suction hazard is also an entrapment hazard.

Suction Line: A pipe that brings water from the pool or spa to the pump. Suction lines are under vacuum when the pump is running. A suction line can be referred to by the system it operates on. For example, "spa suction" means a suction line associated with the spa.

Surge Capacity (of a Surge Tank): The volume of water that can be stored in the space between the normal water level in the surge tank and the pool water level.

Surge Tank: A large tank used to either replenish or withdraw pool water automatically. It is activated using a float valve to sense the level of the water and adjust the flow.

Turnover: The amount of time it takes a pump to move all the water in a pool through the filter and back again.

Underwater Lighting: A fixture designed to illuminate a pool or spa from beneath the water's surface.

v2Vacuums: Devices that use suction to collect dirt from the bottom and sides of a pool or spa. Most common is a vacuum head with wheels that attaches to a pole and is connected to the suction line, usually via the opening in the skimmer. It is normally moved about by a person, and debris is collected in the skimmer basket and filter.

Wave Pool: A pool in which there are artificially generated, reasonably large waves, similar to the ocean. Wave pools are often a major feature of water parks.

Water Feature: A decorative element using flowing water, such as fountain or waterfall.

WorkSafe BC: Promotes workplace health and safety for the 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, health care benefits, and a range of other services.

APPENDIX B: APPLICATION FOR OPERATING PERMIT: POOL DATA SHEET

SEE NEXT PAGE

Application for Operating Permit

Pool Data Sheet

General Pool Information	
Name of Pool:	
Civic Address:	
Pool Type: ☐ public ☐ commercial ☐ hot tub ☐ spray pool ☐ wading pool	Location: ☐ indoor ☐ outdoor

Owner Information	
Name (Legal):	
Address:	
Phone Number:	Email Address:

General Pool Design Parameters			
Water Depth Minimum (m):	Water Depth Maximum (m):	Pool Area (m^2):	Deck Area (m^2):
Pool Volume (m^3):	Pool Basin Colour:	Design Flow Rate (L/min):	Turnover Rate (hours):
Maximum Bathing Load (persons): Shallow: Deep: Total:			

Recirculation Pumps		
RECIRCULATION PUMP	Make and Model:	Flow (L/min): at m TDH
HOT TUB JET PUMP	Make and Model:	Flow (L/min): at m TDH
PUMP (specify):	Make and Model:	Flow (L/min): at m TDH
PUMP (specify):	Make and Model:	Flow (L/min): at m TDH
PUMP (specify):	Make and Model:	Flow (L/min): at m TDH

Application for Operating Permit

Pool Data Sheet

Filtration System

Filter Type: ☐ sand ☐ diatomaceous earth ☐ pressure ☐ vacuum ☐ gravity		NSF Approved: ☐ yes ☐ no	NSF Standard:
Filter Make and Model:		Number of Filters:	Number of Elements:
Surface Area of Each Filter (m^2):	Total Area of All Filters (m^2):	Surface Area of Each Element (m^2):	Total Area of All Elements (m^2):
Rate of Filtration (L/min/m^2):		Total Filter Capacity (L/min) (*Rate of filtration x total area*):	

FILTER BACKWASH	Filter Backwash Pump Make and Model:		
	Flow (L/min): at m TDH	Backwash Rate (L/min/m^2):	Backwash Rate per Filter (L/min):

Gauges

Pressure Gauges (#):	Vacuum Gauges (#):	Temperature Gauges (#):
Flow Meter Make and Model:		Flow Meter Range (L/min): to

Disinfection

Primary Disinfectant: ☐ hypochlorite ☐ chlorine gas ☐ stabilized chlorine ☐ saltwater chlorination ☐ bromine ☐ other:		
Disinfectant Feeder Make and Model:		
Disinfectant Feeder Capacity (kg/24 hrs):	Point of Injection: ☐ filter influent ☐ filter effluent	Maximum Dosing Rate (mg/L):

Chemical Feeders

FEEDER #1	Make and Model:		
	Chemical/Slurry Fed:	Capacity (kg/24 hrs):	Injection Point:
FEEDER #2	Make and Model:		
	Chemical/Slurry Fed:	Capacity (kg/24 hrs):	Injection Point:

Application for Operating Permit

Pool Data Sheet

Pool Inlets			
Inlet Type:	Inlet Size (cm):	Number of Inlets: at m spacing	Depth Below Water Level (cm):

Drains			
Total Number of Drains:			
MAIN DRAIN	Make and Model:		
	Number:	Size of Free Opening (cm^2):	Velocity through Grate Opening (m/sec):
JET PUMP DRAIN (if separate from main drain)	Make and Model:		
	Number:	Size of Free Opening (cm^2):	Velocity through Grate Opening (m/sec):
OTHER DRAIN (specify)	Make and Model:		
	Number:	Size of Free Opening (cm^2):	Velocity through Grate Opening (m/sec):
OTHER DRAIN (specify)	Make and Model:		
	Number:	Size of Free Opening (cm^2):	Velocity through Grate Opening (m/sec):
OTHER DRAIN (specify)	Make and Model:		
	Number:	Size of Free Opening (cm^2):	Velocity through Grate Opening (m/sec):

Overflow (Skimmers/Gutters)					
Overflow Type: ☐ skimmer ☐ raised-edge gutter ☐ roll-out gutter ☐ deck-level gutter ☐ other:					
GUTTERS	Number of Gutter Drains (m spacing):		Gutter Drain Size (cm):		
SKIMMERS	Make and Model:				
	Quantity:	NSF Approved: ☐ yes ☐ no	Total Weir Length (cm):	Maximum Overflow Capacity (L/min):	Normal Flow Through Capacity (L/min):

Application for Operating Permit

Pool Data Sheet

Make Up Water Source			
Source: ☐ public ☐ private	Size of Makeup Line (cm):	Control: ☐ manual ☐ automatic	Air Gap: ☐ yes ☐ no
Backflow Preventer: ☐ yes ☐ no	Backflow Preventer Make and Model:		

Piping (Add extra pages if needed)		
SYSTEM #1	System/Liquid Carried:	Material: ☐ copper ☐ carbon steel ☐ PVC ☐ HDPE ☐ other:
	Maximum Velocity (m/sec):	Return piping to pool: Supply piping to pool:
SYSTEM #2	System/Liquid Carried:	Material: ☐ copper ☐ carbon steel ☐ PVC ☐ HDPE ☐ other:
	Maximum Velocity (m/sec):	Return piping to pool: Supply piping to pool:
SYSTEM #3	System/Liquid Carried:	Material: ☐ copper ☐ carbon steel ☐ PVC ☐ HDPE ☐ other:
	Maximum Velocity (m/sec):	Return piping to pool: Supply piping to pool:

Data Sheet Revision History				
Version	Prepared By	Company	Date	Revision Details

APPENDIX C: APPLICATION FOR CONSTRUCTION PERMIT

SEE NEXT PAGE

Information Requirements supporting the Application for Construction Permit

Pursuant to the Pool Regulation, the person applying for the construction permit shall ensure the attached Pool Information Sheets are duly completed by the project design professionals. Design professionals are design architects who are registered or licensed under the *Architects Act* and/or the design engineers who are registered or licensed as a professional engineer under the *Engineers and Geoscientists Act*. The Pool Information Sheets will be considered as statements of fact to support the health officer's evaluation and decision to issue a construction permit under the Pool Regulation s.5(3).

The person applying for the construction permit shall ensure that all related plans and specifications for the construction as prepared, sealed and certified by an architect or engineer are submitted with this application package. A person must not construct the pool other than in accordance with the plans and specifications submitted with this application, unless prior written approval is obtained from a health officer.

The Pool Owner, or their authorized agent, must sign the declaration in this Application for Construction Permit, confirming the pool will be constructed in accordance with the plans and specifications accompanying this Application for Construction Permit.

Additional Note: Operating Permit Requirements

Once the pool is constructed, an operating permit will be required prior to operating the pool. As part of the information package supporting the application for an operating permit, a signed statement from an engineer or architect must be submitted confirming that the pool has been constructed so as to substantially comply, in all material respects, with the plans and specifications submitted in support of this Application for Construction Permit.

Application for Construction Permit

Application Form

Application To

☐ fraserhealth Better health. Best in health care. ☐ Interior Health ☐ Vancouver CoastalHealth Promoting wellness. Ensuring care. ☐ island health ☐ northern health the northern way of caring

Name of Pool:	Date (dd/mm/yyyy):
Street Address:	

Contact Information

OWNER OR AGENT	Name:	
	Address:	
	Phone Number:	Email Address:
PERSON APPLYING FOR PERMIT (if different from owner)	Name:	
	Address:	
	Phone Number:	Email Address:

Owner's Confirmation of Commitment

I, _____ as owner of the above noted pool, confirm that it will be constructed in accordance with the information contained herein and according to the plans and specifications submitted with this Application for Construction Permit. No changes to the pool plans and specifications will be made unless they have been authorized in writing by the design professional and with written approval from a health officer.

Furthermore, I understand that upon completion of the pool's construction, I must provide the _____ Health Authority with the following documentation before an Operating Permit for the pool can be considered:

- 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 under this Application for Construction Permit.
- A copy of a completed Swimming Pool Data Sheet providing detail of the pool as constructed.
- A copy of the Pool Safety Plan prepared in accordance with s.13 of the Pool Regulation.

Signature of Owner or Authorized Agent:	Date (dd/mm/yyyy):

General Information

Name of Pool:	
Civic Address:	
Pool Type: ☐ public ☐ commercial ☐ hot tub ☐ spray pool ☐ wading pool	☐ indoor ☐ outdoor

Owner Information

Name (Legal):	
Address:	
Phone Number:	Email Address:

Designer Information (Append additional information for multiple designers):

Name:	☐ PEng ☐ Architect
Company (Legal Corporate):	
Address:	
Phone Number:	Email Address:

General Pool Design Parameters (Append additional information for multiple pools):

Pool Volume (m^3):	Pool Area (m^2): pool: deck:	Water Depth (m): min: max:	
Maximum Bathing Load (persons): Shallow: Deep: Total:		Pool Basin Colour:	Color Complies with Pool Reg ☐ yes ☐ no
Turnover (hrs):	Design Flow Rate (L/min):	Gauges (qty): pressure: vacuum: temperature:	
Flow Meter Make and Model:		Range (L/min): from: to:	
Filters: ☐ sand ☐ diatomaceous earth ☐ pressure ☐ vacuum ☐ gravity			NSF Approved: ☐ yes ☐ no
Disinfection: ☐ hypochlorite ☐ chlorine gas ☐ stabilized chlorine ☐ bromine ☐ other:			

Health Hazard Related Design Parameter Reference to Pool Regulation (PR) and B.C. Guidelines for Pool Design (GPD)	Design Parameter Met	Initials
The plans include a fence or other barrier around the pool and its walkways with controlled access to prevent access by animals and persons who are not pool patrons. This provision does not apply to spray pools or wading pools that are planned to be drained before dark and left empty overnight. PR s.(7)	☐ yes ☐ no ☐ n/a	
The pool design provides for the pool water to be maintained at a temperature of no more than 37°C. PR s.10(2)(b)	☐ yes ☐ no	
Disinfection equipment is designed to be capable of maintaining disinfection levels in accordance with the Pool Regulation PR s.10(2)(f) & s.10(2)(g) & Schedule 3, s.1(2)	☐ yes ☐ no	
The pool circulation system is designed so that pool water will not pass through any drain grate at a speed greater than 46 cm per second when the pool is operating at the design flow rate. PR s.10(2)(k) or waiver obtained under s.10(3)	☐ yes ☐ no	
The pool design allows for water to be circulated through the skimmers or gutters at a rate of flow at least equal to 50% of the design flow rate. PR s.10(2)(j)	☐ yes ☐ no	
The pool circulation system is designed so the water circulation rate (pool turnover) will substantially comply with the GPD. GPD – Water Circulation	☐ yes ☐ no	
The pool design substantially complies with the Pool Regulation and the GPD for the prevention of entrapment or suction hazards. PR s.10(2)(k) or waiver obtained under s.10(3); GPD – Main Drain and Suction Entrapment Hazards & Other Entrapment Hazards.	☐ yes ☐ no	
The pool design allows for sufficient lighting so that all areas are visible to pool patrons, lifeguards, and operators. PR s.11(2)(a) ; GPD – Natural and Artificial Lighting	☐ yes ☐ no ☐ n/a	
All pool aprons, walkways and floors have a surface that is slip-resistant when wet, and slopes away from the pool such that, when the aprons, walkways and floors are wet, water does not accumulate or flow back into the pool PR s.11(2)(c) The friction coefficient of tiled surfaces specified for installation in and around the pool is _____ (static/dynamic), and will meet best practice guidelines referenced in the GPD with respect to being non-slip when wet. GPD – Flooring	☐ yes ☐ no	
The design requires that the nose of any step or ledge in the pool is marked in a contrasting colour to the remainder of the step or ledge PR s.11(2)d	☐ yes ☐ no	
The design provides for secure handrails at steps, ladders and diving boards. PR s.11(2)(e)	☐ yes ☐ no	

Health Hazard Related Design Parameter Reference to Pool Regulation (PR) and B.C. Guidelines for Pool Design (GPD)	Design Parameter Met	Initials
The design includes pool depth markings in accordance with the requirement of the Pool Regulation PR s.11(2)(f)	☐ yes ☐ no	
The design includes controls that will allow for regulating hot water temperature in pool facilities to no more than 49°C. PR s.11(2)(g)	☐ yes ☐ no	
The pool design provides for, where applicable, hot tub water to be maintained at a temperature of no more than 40°C. PR s.16(b)	☐ yes ☐ no ☐ n/a	
The filters are designed to provide proper filtration of the water at maximum flow rates as per the GPD. GPD - Filtration	☐ yes ☐ no	
The design incorporates a pool basin surface, that when filled with water, will be light in colour and have a light reflectance value of at least 60%, measured according to ASTM C609-07 standard to substantially comply with the Pool Regulation and the GPD. PR s.3(a); GPD – Pool Basin Colour and Patterns	☐ yes ☐ no	
All diving boards and poolside play equipment are designed and located in accordance with applicable standards referenced in the GPD. GPD – Play Equipment	☐ yes ☐ no	
Backflow preventers are provided in all areas necessary to prevent cross contamination between the potable water supply, pool water and wastewater lines. GPD – Cross Connection Control (AWWA Canadian Cross Connection Control Manual)	☐ yes ☐ no	

Design Professionals

The design professional responsible for each component noted in the Health Hazard Related Design Parameter Checklist above shall initial applicable row(s) as a confirmation to a statement of fact and fill in the information in the table below.

Design Professional Name	Engineer or Architect	Company	Initials