

Public Pool Standards and Guidelines

Public Health Division
Department of Health and Community Services
March 2023

POLICY:

The *Water Quality & Record Keeping Standards* provide the bacteriological, chemical and physical water quality standards for public pools in Newfoundland and Labrador.

The Standards are to be followed by public pool operators. Environmental Health Officers with Service NL will inspect public pools in accordance with the Standards and Public Pools Regulations.

The Standards provide guidance to regulatory authorities and pool operators in the effective operation of public pools to ensure that public pool water is physically, chemically and bacteriological safe.

Regulations:

Public Pools Regulations, 1996
Sections 13(Water Quality) & Section 17 (Records)



Public Pool

Water Quality

and

Record Keeping Standards

Department of Health and Community Services
Public Health Division

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SECTION 1: WATER QUALITY PARAMETERS

A) CHEMICAL PARAMETERS

There are five main chemical parameters which are important in the operation of public pools. They are:

1) pH

- pH is defined as a measure of the acidity and basicity of pool water.
- Recommended range in public pools: **7.2 - 7.8**
- Pool Problems:

	Low pH	High pH
Problem	corrosion	scaling
	chlorine loss	chlorine inefficiency
	staining	cloudy pool
	eye & skin irritation	eye & skin irritation

2) Total Alkalinity (TA)

- Total alkalinity (TA) is the measurement of the ability of pool water to resist changes in pH. Total alkalinity is the governor of pH.
- Recommended range in public pools: **80 - 120 ppm** (ppm - parts per million)
- Pool Problems:

	Low TA	High TA
Problem	pH bounce	pH drift to 8.4
	corrosion	scaling
	staining	cloudy pool

3) **Hardness**

- Hardness is the amount of calcium in solution in pool water.
- Recommended range in public pools: **200 - 300 ppm**
- Pool Problems

	Low Hardness	High Hardness
Problem	water will etch plaster, pit metal or roughen pool surfaces	scaling
	staining	cloudy pool

4) **Disinfectants**

- A disinfectant is an agent which reduces the level of micro-organisms present in significant numbers (usually 99.9% or more) to safe levels as established by Federal or Provincial Health Authorities.
- Chlorine and bromine compounds are the most common disinfectants used in public pools.
- **Chlorine** is available in many forms such as chlorine gas, calcium hypochlorite, sodium hypochlorite, lithium hypochlorite, Trichloro-S-Triazinetrione and Sodium Dichloro-S-Triazinetrione. Recommended residuals for free available chlorine (FAC) in public pools are as follows:

1. All Public Pools Classes Except Class B: Whirlpool, Spa Types of Pools:

- Indoor Pools: **1.5 ppm** (minimum acceptable limit 0.5 ppm)
- Outdoor Pools: **3.0 ppm** (minimum acceptable limit 1.0 ppm)

Note: The FAC residual should not be greater than 5 ppm when bathers are in the pool water.

2. Class B: Whirlpool, Spa Types of Pools

- Indoor and Outdoor Pools: **2 - 3 ppm**

- **Bromine** used in public pools is available in two forms. They are:
 - organic bromine and
 - sodium bromide and potassium monopersulfate

Recommended residuals for total bromine are:

1. All Public Pools Classes Except Class B: Whirlpool, Spa Types of Pools

- **2 - 3 ppm**

2. Class B: Whirlpool, Spa Types of Pools

- **2 - 4 ppm**

5) Stabilizer (Cyanuric Acid)

- Ultraviolet rays of sunlight dissipate free available chlorine in outdoor pools quickly. Thus, stabilizer is used in outdoor pools to prevent chlorine from evaporating or dissipating from the pool water. The stabilizer used in outdoor pools is cyanuric acid. Chlorine residuals (free available chlorine) stabilized with cyanuric acid usually lasts three to five times longer. **Please note that a stabilizer is not recommended for indoor pools.**
- There are two choices to ensure cyanuric acid is present in outdoor pools. They are:
 - use of a stabilized chlorine
 - separate use of an unstabilized chlorine and a stabilizer
- Recommended range for **cyanuric acid** in outdoor pools: **25 - 50 ppm**
- Cyanuric acid should not exceed 100 ppm. Levels above this limit reduce the disinfecting power of chlorine.

B) PHYSICAL PARAMETERS

1. **Water Temperature**

Recommended water temperature range:

1. All Public Pools Classes Except Class B: Spa/Whirlpool Types of Pools
 - **21°C - 32°C**
2. Class B: Spa/Whirlpool Types of Pools
 - **36°C - 38°C** (Note: the maximum temperature should never exceed **40°C**)

C) BACTERIOLOGICAL STANDARDS

There are four bacteriological standards that public pools must meet. They are:

Test	Standard	Comment
<i>E. coli</i>	<p style="text-align: center;">0 per 100 ml sample</p> <p>Note: repeat sample must be taken to confirm presence of <i>E. coli</i></p>	Indicator of the effectiveness of disinfection and recent fecal contamination
<i>Staphylococcus aureus</i>	<p style="text-align: center;">50 or less per 100 ml sample</p> <p>Note: repeat sample must be taken to confirm presence of <i>Staphylococcus aureus</i> at levels above the standard</p>	Indicator of water contamination
<i>Pseudomonas aeruginosa</i>	<p style="text-align: center;">10 or fewer per 100 ml of sample</p> <p>Note: repeat sample must be taken to confirm <i>Pseudomonas aeruginosa</i> at levels above the standard</p>	This organism is a pathogen in pools, spas and whirlpools.
Standard Plate Count	<p style="text-align: center;">250 or fewer per 1 ml of sample</p> <p>Note: repeat sample to confirm SPC at levels above the standard</p>	Indicator of a deficiency in the treatment process

Some of the above-noted tests can be performed through the Regional Water Test Sites. Other tests can only be performed at the Newfoundland and Labrador Public Health Laboratory in St. John's, or at a private accredited laboratory for *Pseudomonas* and *Staphylococcus* testing. A summary of water quality requirements is outlined in Appendix 1.

SECTION 2: TESTING METHODOLOGY

A) REQUIREMENTS FOR POOL OPERATORS

All pool operators are to perform and record the following tests at the indicated time intervals:

Test	Time Intervals (Frequency)	Comments
1) Free Available Chlorine Residual if used as a disinfectant for the pool	½ hour before opening and every four hours when pool is in operation	This is the level of the uncombined chlorine in the pool water available to kill harmful germs
2) Total Chlorine Residual if used as a disinfectant for the pool	½ hour before opening and every four hours when pool is in operation	Total chlorine residual is defined as the sum of the uncombined chlorine (free available chlorine) and the combined chlorine. Combined chlorine is the free available chlorine which has combined with wastes to produce chloramines. Combined chlorine has very little disinfecting power but causes the chlorine odour in a pool. It is also responsible for eye irritation. The total chlorine residual must not exceed the free available chlorine residual by more than 0.5 ppm in the pool. Example: If the free available chlorine residual is 0.8 ppm then total chlorine residual in the pool must not be greater than 1.3 ppm.
3) Total Bromine Residual if used disinfectant in the pool	½ hour before opening and every four hours when pool is in operation	This is level of bromine in the pool water available to kill harmful germs

Test	Testing Frequency	Comments
4) pH	½ hour before opening and every four hours when pool is in operation	High or low pH can affect the efficiency of chlorine to kill harmful germs
5) Water Temperature	a) once a day for all public pool classes except Class B: whirlpool, spa types of pools b) every four hours for Class B: whirlpool, spa types of pools	This is important for the comfort of users of the pool.
6) Total Alkalinity	a) once a week for all public pool classes except Class B: whirlpool, spa types of pools b) once a day for Class B: whirlpool, spa types of pools	This is important in maintaining the recommended pH levels in a pool.
7) Hardness	once a week	May cause staining or cloudiness if the proper levels are not maintained.
8) Stabilizer (Cyanuric Acid) - Used in outdoor pools only	a) once a week for all public pool classes except Class B: whirlpool, spa types of pools b) once a day for Class B: whirlpool, spa types of pools	Use to prevent chlorine from evaporating or dissipating from the pool water

B) REQUIREMENTS FOR ENVIRONMENTAL HEALTH OFFICERS

During each visit, EHOs should carry out the same tests as required by the pool operators [see section 2(A) above]. Bacteriological samples are not required to be collected during routine public pool inspections. Sampling may be necessary as part of an investigation or recreational water illness (RWI) [see section 1(C) - Bacteriological Standards for the various types of tests].

SECTION 3: EQUIPMENT

Pool operators and EHOs should have equipment capable of testing the following pool water parameters:

- Free Available Chlorine Residual
- Total Chlorine Residual
- Total Bromine Residual (if bromine is used as a disinfectant)
- Hardness
- pH
- Temperature
- Total Alkalinity
- Cyanuric Acid (if stabilizer used)

SECTION 4: RECORD KEEPING

Daily pool operational records must be maintained by the pool operator and be available for auditing by the EHO. An audit of the records should be performed during each scheduled inspection. Records audited by the EHOs should be initialed.

Templates for the recording of pool chemical and physical water quality information are provided in appendices 2 and 3. The template in appendix 2 can be used for all public pools except Class B: whirlpool, spa types of pools. For Class B: whirlpool, spa types of pools (as defined in Section 4(1) b(ii) of Public Pool Regulations, 1996), operators can use the template provided in appendix 3.

Data must be retained for a period of one year from the date of making the record.

SECTION 5: TROUBLE SHOOTING

As listed below, this section identifies the most common water quality problems experienced in swimming pools, determines the possible causes and provides possible recommendations (remedies) to issue.

PROBLEM	POSSIBLE CAUSE	REMEDY
ALGAE GROWTH <ul style="list-style-type: none"> • green algae • slippery walls • algae stains • black algae 	◆ Hot sunny weather	☛ Maintain high free available chlorine (FAC).
	◆ Pool temperature too high	☛ Keep below 26.7°C (80°F).
	◆ Poor circulation (dead spots in pool)	☛ Reposition directional outlets and check efficiency of pump. Hand dose corners. Check flow rate.
	◆ Low wet spots on deck	☛ Eliminate, if possible. Hand dose with dry chlorine.
	◆ Low free available chlorine (FAC)	☛ Maintain a FAC greater than 5.0 ppm overnight. Brush walls vigorously, then vacuum. Add algicide and adjust PH.
	◆ Total available chlorine (TAC) mostly made up of combined available chlorine (CAC)	☛ Superchlorinate. Maintain FAC and combined available chlorine (CAC) at recommended concentrations.

PROBLEM	POSSIBLE CAUSE	REMEDY
ATHLETE'S FOOT	♦ Fungus on pool decks, change room and shower floors	☛ Exclude people with athlete's foot from pool, disinfect.
CARBONATE PRECIPITATE • scale/cloudy/residue	♦ High pH and total alkalinity	☛ Maintain pH of 7.2 to 7.4 until total alkalinity decreases to 80 ppm. Raise calcium hardness to obtain "balanced" water.
CHLORINE CONSUMPTION HIGH	♦ Heavy bather load, high dirt load, heavy rain or wind storms	☛ Superchlorinate
	♦ Low stabilizer level	☛ Add stabilizer (outdoor pools only!)
CHLORINE RESIDUAL TOO HIGH	♦ Chlorine demand has dropped exceeds feed rate	☛ Turn off chlorinator ☛ Dilution ☛ Aeration ☛ Sunlight ☛ Addition of dechlorinating agents
	♦ Excessive stabilizer level	☛ Dilution
CHLORINE RESIDUAL LOW	♦ Rate of feed too low	☛ Boost rate of feed
	♦ Demand above normal due to heavy swimming load, hot sunny weather, algae, debris blows into pool - leaves, etc.	☛ If chlorinator capacity is not sufficient, supplement chlorine feed by hand dosage of hypochlorites.
	♦ Corrosion or plugging of chlorination system	☛ Shut off chlorine unit and check.
	♦ Low stabilizer level	☛ Increase stabilizer level to 50 ppm cyanuric acid (outdoor pools only!)
CHLORINE ODOUR, SWIMMER'S EYE AND SKIN IRRITATION	♦ CAC too high	☛ Superchlorinate to reduce CAC. ☛ If chronic, install ozone system (corona discharge). ☛ Dilution
	♦ Improper pH	☛ Adjust pH

PROBLEM	POSSIBLE CAUSE	REMEDY
CLOUDY WATER	♦ High CAC	☛ Superchlorinate.
	♦ pH too high	☛ Lower pH.
	♦ Total alkalinity too high	☛ Reduce until balanced.
	♦ Calcium hardness too high	☛ Lower until balanced.
	♦ Extremely small particles in pool water caused by storm, etc.	☛ Floc sand with clear-aid or alum.
	♦ Poor circulation in certain areas	☛ Readjust directional ball inlets
	♦ Excessive total dissolved solids (TDS)	☛ Dilution ☛ Drain and fill
	♦ In pools using diatomite filters, it is usually due to diatomaceous earth in the pool. Faulty precoat procedures to broken or torn elements are the usual cause.	☛ Check and/or repair filter elements. ☛ Check and adjust precoat procedures.
♦ Improper application of non-chlorine shock treatment chemicals	☛ Follow manufacturer's instructions. ☛ Use calcium hypochlorite.	
CLOUDY RED-BROWN WATER	♦ This is usually due to precipitated iron.	☛ The precipitate can be settled and vacuumed or filtered from water. The filters will have to be turned off. In extreme cases, the settling process can be aided by adding alum to the pool surface. Allow the alum to settle quietly overnight. Ensure the pH of the water is above 7.6 before using alum. Check the manufacturer's instructions when using alum.
COLOURED WATER - BROWN, BLUE, BLACK (usually after initial filling of pool)	♦ Metallic ions in the water; brown is iron, blue is copper, black is manganese.	☛ Increase pH to 7.8 and vacuum the precipitate off the pool bottom to the waste line.

PROBLEM	POSSIBLE CAUSE	REMEDY
COLOURED WATER - GREEN	♦ Algae bloom	☛ Superchlorinate. Maintain an adequate free available chlorine (FAC).
	♦ Dissolved iron	☛ Superchlorination will convert dissolved iron to a red-brown precipitate which can be vacuumed.
	♦ Over stabilization	☛ Dilution
	♦ Improper use of bromine	☛ Dilution
COLOURED WATER - MURKY BROWN	♦ Insufficient backwashing	☛ Backwash
	♦ Inadequate filter run	☛ Increase the filter run.
	♦ Channels in filter run	☛ Increase the backwashing time. ☛ Increase the backwashing rate. ☛ Add decalcification chemical. ☛ Change the sand.
CORROSIVE WATER • corroded/stained fixtures • pump/heater pipe corrosion	♦ Low pH	☛ Maintain pH at 7.4 to 7.5
	♦ Low total alkalinity	☛ Increase total alkalinity to 80 - 120 ppm.
FOULED POOL	♦ Fouled by vomit and/or feces See Appendix 4 for more details	a) Clear the pool of bathers b) Remove matter with a skimmer, scoop, etc. Disinfect equipment. c) Raise free chlorine (see Appendix 4). Ensure water pH 7.5 or less and 25°C or higher. d) Maintain chlorine levels to achieve target contact time values (Appendix 4). Ensure filtration system is operating. e) For diarrhea, backwash the filter. Direct backwash water to sewer. Replace filter media as needed. f) Return free chlorine and pH to normal operating range.

PROBLEM	POSSIBLE CAUSE	REMEDY
GREEN HAIR	<ul style="list-style-type: none"> ◆ Results from copper ions in the water by an overdose of copper-based algacides. 	<ul style="list-style-type: none"> ☛ Discontinue use of copper-base algacides and maintain proper pH to prevent corrosion of copper pipes in the system. ☛ Drain portion of pool volume and fill with fresh water.
pH DIFFICULT TO READ	<ul style="list-style-type: none"> ◆ High free chlorine dosage fades or changes colour produced in sample. 	<ul style="list-style-type: none"> ☛ Wait until free chlorine lowers or add sodium thiosulphate (available from pool supplier) to sample before running pH test.
	<ul style="list-style-type: none"> ◆ Tube and cap are dirty 	<ul style="list-style-type: none"> ☛ Clean tubes and caps thoroughly; rinse using pool water.
	<ul style="list-style-type: none"> ◆ pH less than 6.8 or greater than 8.2 	<ul style="list-style-type: none"> ☛ Adjust pH to swimming pool range (i.e. 7.2 to 7.8).
pH DROPPING	<ul style="list-style-type: none"> ◆ Acidic disinfectants ◆ Heavy bathing load 	<ul style="list-style-type: none"> ☛ Add soda ash (Na_2CO_3)
pH FLUCTUATING	<ul style="list-style-type: none"> ◆ Low total alkalinity 	<ul style="list-style-type: none"> ☛ Have total alkalinity tested. ☛ Add sodium bicarbonate (NaHCO_3)
pH HIGH	<ul style="list-style-type: none"> ◆ Algae (tends to raise pH) 	<ul style="list-style-type: none"> ☛ Superchlorinate and adjust pH
	<ul style="list-style-type: none"> ◆ pH adjustment too high 	<ul style="list-style-type: none"> ☛ Lower pH
	<ul style="list-style-type: none"> ◆ Hypochlorite disinfectant 	<ul style="list-style-type: none"> ☛ Lower pH
pH LOW	<ul style="list-style-type: none"> ◆ pH/chlorine dosages incorrect 	<ul style="list-style-type: none"> ☛ Raise pH
SAND IN POOL	<ul style="list-style-type: none"> ◆ Failure of filter underdrain system 	<ul style="list-style-type: none"> ☛ Remove filter sand, check and replace underdrains as necessary.
	<ul style="list-style-type: none"> ◆ Filter sand grain size inadequate 	<ul style="list-style-type: none"> ☛ Filter sand should meet manufacturer's specifications.
SCALE FORMATION ON POOL WALLS OR EQUIPMENT	<ul style="list-style-type: none"> ◆ pH too high ◆ Total alkalinity too high ◆ Calcium hardness too high 	<ul style="list-style-type: none"> ☛ Balance pool water according to Langelier's saturation index
SCUM ON POOL WALLS	<ul style="list-style-type: none"> ◆ Inadequate skimming 	<ul style="list-style-type: none"> ☛ Check float weir, increase flow rate through skimmers. Scrub pool walls.
	<ul style="list-style-type: none"> ◆ Body oils and cosmetic lotions used by swimmers 	<ul style="list-style-type: none"> ☛ Shower with soap and warm water before entering pool. Recommend bathing caps be worn. Scrub pool walls.

PROBLEM	POSSIBLE CAUSE	REMEDY
SLIPPERY POOL DECKS	♦ Algae growth	☛ Clean with 100 ppm hypochlorite solution. Let stand, then rinse area thoroughly. Repeat with stronger solution if necessary.
TURBIDITY	♦ Insufficient backwashing	☛ Backwash
	♦ Poor floc on filter sand	☛ Add alum. Check manufacturer's instructions.
	♦ Windblown dust	☛ More vacuuming - cover when closed - increase turnover rate
	♦ Poor re-circulation	☛ Maintain design flow rate and check filter's backwash more often if necessary.
	♦ Iron in suspension	a) Add make-up water through filter b) Flush supply and make-up lines occasionally. c) Add alum to the entire pool surface and let settle. Vacuum precipitate to waste. Check manufacturer's instructions.
WHITE RING AROUND THE WATER LEVEL TILE	♦ Calcium salts in hard water, high pH	☛ Lower pH with sodium bisulphate or muriatic acid ☛ Maintain pH level of 7.2 - 7.8

SECTION 6: WHEN TO CLOSE A POOL

1. Pool contaminated with **fecal material and/or vomitus**.
2. Pool water is **cloudy** and the bottom drain cannot be seen from the pool deck.
3. **Chemical Imbalance**.
 - If the pool water chemistry becomes imbalanced to a point that minor adjustments cannot correct it, and a significant amount of chemical must be added, it will be necessary to close the pool.
4. Unsatisfactory **bacteriological tests**.
 - repeat sample confirms the presence of *E. coli**
 - repeat sample confirms presence of greater than 50 *Staphylococcus aureus* per 100 ml sample*
 - repeat sample confirms the presence of greater than 50 *Pseudomonas aeruginosa* per 100 ml sample*

* Refer to *Guidelines for Applying Public Pool Bacteriological Standards* details.
5. Pool has no disinfectant residual (e.g., free available chlorine or total bromine).
6. Mechanical Failure
 - Improperly working filters and pumps will not be able to effectively do their job.

Pool operators must always inform an Environmental Health Officer (EHO) with the Government Service Centre (GSC) of their pool closure. The EHO must immediately inform the MOH, or designate, of any pool closure.

SECTION 7: REFERENCES

1. City of Winnipeg - Community Services Department (Environmental Health Services), **“Pool Safe - Level 1, Swimming Pool and Whirlpool Operator’s Handbook”**, Third Edition, 1995
2. Dr. Lowry, **“Lowry’s School of Pool and Spa Maintenance - Level 1 Workbook”**, 1995
3. Health and Welfare Canada - Environmental Health Directorate (Health Protection Branch), **“Swimming Pool Water Quality”**, November 1978
4. Ontario Ministry of Health, **“Recommended Standards for the Operation of Public Spas”**, 1989
5. City of Scarborough Health Department, **“Seminar for Lifeguards and Public Pool Operators”**
6. NS Department of Health, **“Guidelines for Swimming Pools”**
7. PEI Department of Health and Social Services, **“A Guide to Swimming Pool Policies and Procedures on Prince Edward Island”**
8. Northern Light Regional Health Services, **“Pool Operators Course”**

SECTION 8: APPENDICES

APPENDIX 1: WATER QUALITY REQUIREMENTS FOR VARIOUS CLASSES OF PUBLIC POOLS

Parameter/Standard	Class of Pool	Type of Pool	
		Indoor	Outdoor
pH	A, B, & C (All Classes)	7.2 - 7.8	7.2 - 7.8
Total Alkalinity	A, B, & C (All Classes)	80 - 120 ppm	80 - 120 ppm
Hardness	A, B, & C (All Classes)	200 - 300 ppm	200 - 300 ppm
Disinfectant:			
1. Chlorine (Free Available Chlorine)	a) All public pools except Class B: spa/ whirlpool types of pools	1.5 (minimum acceptable limit 0.5 ppm)	3 ppm (minimum acceptable limit 1.0 ppm)
	b) Class B: spa/ whirlpool types of pools	2 - 3 ppm	2 - 3 ppm
2. Total Bromine	a) All public pools classes except Class B: spa/whirlpool types of pools	2 - 3 ppm	2 - 3 ppm
	b) Class B: spa/ whirlpool types of pools	2 - 4 ppm	2 - 4 ppm
Stabilizer - Cyanuric Acid	A, B, & C (All Classes)	Not Applicable	25 - 50 ppm
Water Temperature	a) All public pools classes except Class B: spa/whirlpool types of pools	21°C - 32°C	21°C - 32°C
	b) Class B: spa/ whirlpool types of pools	36°C - 38°C	36°C - 38°C

Parameter/Standard	Class of Pool	Type of Pool	
		Indoor	Outdoor
<i>E. coli</i>	A, B, & C (All Classes)	0 per 100 ml of sample	0 per 100 ml of sample
<i>Staphylococcus aureus</i>	A, B, & C (All Classes)	50 or fewer per 100 ml of sample	50 or lower per 100 ml of sample
<i>Pseudomonas aeruginosa</i>	A, B, & C (All Classes)	10 or fewer per 100 ml of sample	10 or less per 100 ml of sample
Standard Plate Count	A, B, & C (All Classes)	250 or fewer per 1 ml of sample	250 or lower per 1 ml of sample

Template

(For use in all Public Pools except
Class B: whirlpool, spa, types of pools)

DAILY RECORD OF OPERATION

Appendix 2

*ppm - parts per million

NAME OF POOL	LOCATION	OPERATOR & TELEPHONE NO.	DATE	DAY
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HOURLY WATER TESTS

TEST		½ HOUR BEFORE OPENING TIME:		4 HOURS AFTER OPENING TIME:		8 HOURS AFTER OPENING TIME:		12 HOURS AFTER OPENING TIME:		16 HOURS AFTER OPENING TIME:	
			No. of Bathers		No. of Bathers		No. of Bathers		No. of Bathers		No. of Bathers
Free Available Chlorine Residual (If chlorine is used as a sanitizer)	ppm*										
Total Chlorine Residual (If chlorine is used as disinfectant)	ppm										
Total Bromine Residual (If bromine is used as disinfectant)	ppm										
pH											

DAILY TEST

WATER TEMPERATURE	°C
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WEEKLY TESTS TO BE PERFORMED EVERY MONDAY

TOTAL ALKALINITY	ppm	STABILIZER (CYANURIC ACID) CONCENTRATION - USED IN OUTDOOR POOLS ONLY	ppm	HARDNESS	ppm
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COMMENTS (ITEMS OF NOTE) _____

Signature of Recording Person

Template

(For use in all Class B: whirlpools, spas, natural hot water pool, roman bath, hydro-swivel or hydro-therapy pool)

***ppm - parts per million**

NAME OF POOL	LOCATION	OPERATOR & TELEPHONE NO.	DATE	DAY
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HOURLY WATER TESTS

TEST		½ HOUR BEFORE OPENING TIME:	4 HOURS AFTER OPENING		8 HOURS AFTER OPENING		12 HOURS AFTER OPENING		16 HOURS AFTER OPENING	
			TIME:	No. of Bathers	TIME:	No. of Bathers	TIME:	No. of Bathers	TIME:	No. of Bathers
Free Available Chlorine Residual (If chlorine is used as disinfectant)	ppm*									
Total Chlorine Residual (If chlorine is used as disinfectant)	ppm									
Total Bromine Residual (If bromine is used as disinfectant)	ppm									
pH										
Water Temperature	°C									

DAILY TESTS

TOTAL ALKALINITY	ppm	STABILIZER (CYANURIC ACID) CONCENTRATION - USED IN OUTDOOR POOLS ONLY	ppm
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WEEKLY TEST TO BE PERFORMED EVERY MONDAY

HARDNESS	ppm
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COMMENTS (ITEMS OF NOTE) _____

Signature of Recording Person

Fecal Incident Response Recommendations for Pool Staff*

What do you do when you
find poop in the pool?



*Check for existing guidelines from your local or state regulatory agency before use. CDC recommendations do not replace existing state or local regulations or guidelines.

- These recommendations are for responding to fecal incidents in chlorinated recreational water venues.
- Improper handling of chlorine-based disinfectants can cause injury. Follow proper occupational safety and health requirements when following these recommendations.
- **Pool Closures:** Fecal incidents are a concern and an inconvenience to both pool operators and patrons. Pool operators should carefully explain to patrons why the pool needs to be closed in response to a fecal incident. Understanding that pool closure is necessary for proper disinfection and protection of the health and safety of swimmers is likely to promote support rather than frustration. Pool closures allow chlorine to do its job — to kill germs and help prevent recreational water illnesses (RWIs).

Important background info...

WHAT ARE RECREATIONAL WATER ILLNESSES (RWIs)?

What is the first thing that pops into your head when you think about water safety? Drowning? Slipping? Lightning? All good answers, and all are very important. But, did you know that germs can contaminate swimming water? These germs cause RWIs that have made many people sick.

RWIs are caused by germs such as “Crypto” (KRIP-toe), short for *Cryptosporidium*, *Giardia* (gee-ARE-dee-uh), *E. coli* 0157:H7, and *Shigella* (Shi-GEL-uh).

HOW ARE RWIs SPREAD?

RWIs are spread by swallowing pool water that has been contaminated with fecal matter. How? If someone has diarrhea, that person can easily contaminate the pool. Think about it. Pool water is shared by every swimmer. Really, it’s communal bathing water. It’s not sterile. It’s not drinking water.

The good news is that germs causing RWIs are killed by chlorine. However, chlorine doesn’t work right away. It takes time to kill germs and some germs like Crypto can live in pools for days. Even the best maintained pools can spread illness.

SHOULD ALL FECAL INCIDENTS BE TREATED THE SAME?

No. A diarrheal fecal incident is a higher-risk event than a formed-stool incident. With most diarrheal illnesses, the number of infectious germs found in each bowel movement decreases as the diarrhea stops and the person’s bowel movements return to normal. Therefore, a formed stool is probably less of a risk than a diarrheal incident that you may not see.

A formed stool may contain no germs, a few, or many that can cause illness. You won’t know. The germs that may be present are less likely to be released into the pool because they are mostly contained within the stool. However, formed stool also protects germs inside from being exposed to the chlorine in the pool, so prompt removal is necessary.

Germ Inactivation Time for Chlorinated Water*

Germ	Time
<i>E. coli</i> O157:H7 Bacterium	Less than 1 minute
Hepatitis A Virus	About 16 minutes
<i>Giardia</i> Parasite	About 45 minutes
Crypto Parasite	About 15,300 minutes or 10.6 days [†]

SHOULD YOU TREAT A FORMED FECAL INCIDENT AS IF IT CONTAINS CRYPTO?

No. In 1999, pool staff volunteers from across the country collected almost 300 samples from fecal incidents that occurred at water parks and pools.[†] CDC then tested these samples for Crypto and *Giardia*. None of the sampled feces tested positive for Crypto, but *Giardia* was found in 4.4% of the samples collected. These results suggest that formed fecal incidents pose only a very small Crypto threat but should be treated as a risk for spreading other germs (such as *Giardia*). Remember a diarrheal fecal incident is considered to be a higher-risk event than a formed-stool fecal incident.

* 1 parts per million (ppm) or mg/L free chlorine at pH 7.5 or less and a temperature of 77°F (25°C) or higher.

[†] Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(4):513–20.

^{††} CDC. Prevalence of Parasites in Fecal Material from Chlorinated Swimming Pools — United States, 1999. MMWR 2001;50(20):410–2.

What do I do about...

Note:

For Vomitus Follow the Procedures for Formed Stool.

formed stool in the pool?

Formed stools can act as a container for germs. If the fecal matter is solid, removing the feces from the pool without breaking it apart will limit the degree of pool contamination. In addition, RWIs are more likely to be spread when someone who is ill with diarrhea has a fecal incident in the pool.

diarrhea in the pool?

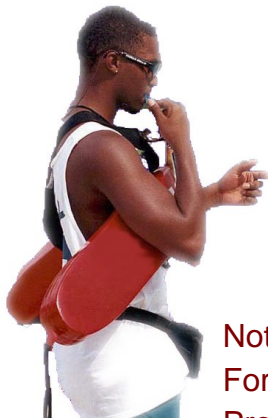
Those who swim when ill with diarrhea place other swimmers at significant risk for getting sick. Diarrheal incidents are much more likely than formed stool to contain germs. Therefore, it is important that all pool managers stress to patrons that swimming when ill with diarrhea is an unhealthy swimming behavior.

1. **For both formed-stool and diarrheal fecal incidents,** close the pool to swimmers. If you have multiple pools that use the same filtration system — all pools will have to be closed to swimmers. Do not allow anyone to enter the pool(s) until the disinfection process is completed.
2. **For both formed-stool and diarrheal fecal incidents,** remove as much of the fecal material as possible (for example, using a net or bucket) and dispose of it in a sanitary manner. Clean and disinfect the item used to remove the fecal material (for example, after cleaning, leave the net or bucket immersed in the pool during disinfection).

VACUUMING STOOL FROM THE POOL IS NOT RECOMMENDED.

3. Raise the free chlorine to 2 parts per million (ppm), if less than 2 ppm, and ensure pH 7.5 or less and a temperature of 77°F (25°C) or higher. This chlorine concentration was selected to keep the pool closure time to approximately 30 minutes. Other concentrations or closure times can be used as long as the contact time (CT) inactivation value* is achieved (see next page).

4. Maintain free chlorine concentration at 2 ppm and pH 7.5 or less for at least 25 minutes before reopening the pool. State or local regulators may require higher free chlorine levels in the presence of chlorine stabilizers,[†] which are known to slow disinfection. Ensure that the filtration system is operating while the pool reaches and maintains the proper free chlorine concentration during the disinfection process.



Note:
For Vomitus Follow the
Procedures for
Formed Stool.

3. If necessary, before attempting the hyperchlorination of any pool, consult an aquatics professional to determine the feasibility, the most optimal and practical methods, and needed safety considerations.
4. Raise the free chlorine concentration to 20 ppm^{¶§} and maintain pH 7.5 or less and a temperature at 77°F (25°C) or higher. The free chlorine and pH should remain at these levels for at least 12.75 hours to achieve the CT inactivation value of 15,300.** **Crypto CT inactivation values are based on killing 99.9% of Crypto. This level of Crypto inactivation cannot be reached in the presence of 50 ppm chlorine stabilizer, even after 24 hours at 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C).^{††} Extrapolation of these data suggest it would take approximately 30 hours to kill 99.9% of Crypto in the presence of 50 ppm or less cyanuric acid, 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C) or higher.**
5. Confirm that the filtration system is operating while the water reaches, and is maintained, at the proper chlorine level for disinfection.
6. Backwash the filter after reaching the CT inactivation value. Be sure the effluent is discharged directly to waste and in accordance with state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.
7. Allow swimmers back into the water only after the required CT inactivation value has been achieved and the free chlorine and pH levels have been returned to the normal operating range allowed by the state or local regulatory authority.

Establish a fecal incident log. Document each fecal incident by recording date and time of the event, whether it involved formed stool or diarrhea, and the free chlorine and pH levels at the time of observation of the event. Before reopening the pool, record the free chlorine and pH levels, the procedures followed in response to the fecal incident (including the process used to increase chlorine levels if necessary), and the contact time.

* CT inactivation value refers to concentration (C) of free chlorine in ppm (or mg/L) multiplied by time (T) in minutes at a specific pH and temperature.

† Chlorine stabilizers include compounds such as cyanuric acid, dichlor, and trichlor.

¶ Many conventional test kits cannot measure free chlorine levels this high. Use chlorine test strips that can measure free chlorine in a range that includes 20–40 ppm (such as those used in the food industry) or make dilutions with chlorine-free water when using a standard DPD test kit.

§ If pool operators want to use a different free chlorine concentration or inactivation time, they need to ensure that CT inactivation values always remain the same (see next page for examples of how to accomplish this).

** Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(4):513–20.

†† Shields JM, Arrowood MJ, Hill VR, Beach MJ. The effect of cyanuric acid on the chlorine inactivation of *Cryptosporidium parvum*. J Water Health 2008; 7(1): 109–114.

Pool disinfection time...

How long does it take to disinfect the pool after a fecal incident? This depends on what type of fecal incident has occurred and at which free chlorine levels you choose to disinfect the pool. If the fecal incident is formed stool, follow Figure 1, which displays the specific time and free chlorine levels needed to inactivate *Giardia*. If the fecal incident is diarrhea, follow Figure 2, which displays the specific time and free chlorine levels needed to inactivate Crypto.

Figure 1 *Giardia* Inactivation Time for a Formed-Stool Fecal Incident

Free Chlorine Level (ppm)	Disinfection Time*
1.0	45 minutes
2.0	25 minutes
3.0	19 minutes

* These closure times are based on 99.9% inactivation of *Giardia* cysts by chlorine at pH 7.5 or less and a temperature of 77°F (25°C) or higher. The closure times were derived from the U.S. Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. These closure times do not take into account "dead spots" and other areas of poor pool water mixing.

Figure 2 Crypto Inactivation Time for a Diarrheal Fecal Incident

Free Chlorine Level (ppm)	Disinfection Time*†
10	1,530 minutes (25.5 hours)
20	765 minutes (12.75 hours)
40	383 minutes (6.5 hours)

* Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(4):513–20.

† At pH 7.5 or less and a temperature of 77°F (25°C) or higher.



The **CT inactivation value** is the concentration (C) of free chlorine in ppm multiplied by time (T) in minutes (CT inactivation value = C x T). The CT inactivation value for *Giardia* is 45 and the CT inactivation value for Crypto is 15,300 (pH 7.5 or less and a temperature of 77°F [25°C] or higher). If you choose to use a different free chlorine concentration or inactivation time, you must ensure that the CT inactivation values remain the same.

For example, to determine the length of time needed to disinfect a pool after a diarrheal incident at 15 ppm, use the following formula: $C \times T = 15,300$.

Solve for time: $T = 15,300 \div 15 \text{ ppm} = 1020 \text{ minutes}$ or 17 hours. It would take 17 hours to inactivate Crypto at 15 ppm.

Note:

For Vomitus Follow the Procedures for Formed Stool.

APPENDIX 5: GLOSSARY

ACID

A chemical compound which releases hydrogen ions in a water solution.

ALGAE

Plant life of many colours which grows in water in the presence of sunlight and carbon dioxide. In swimming pools it produces slippery spots and cloudy, uninviting water.

ALGICIDE

A chemical which will kill algae.

ALGISTAT

A chemical which inhibits growth of algae.

ALKALINITY

The amount of bicarbonate, carbonate, or hydroxide compounds present in a water solution. Total alkalinity is a measure of the buffering capacity of water against rapid pH change.

ALUM

An aluminum compound applied in pools to produce a gelatinous floc in sand filters, or to coagulate and precipitate suspended particles out of solution.

AMMONIA

A chemical compound that contains nitrogen and hydrogen that combines with free chlorine in pools to form chloramines or combined available chlorine.

APPURTENANCES

Accessory objects or parts.

BACKWASH

Reversing the flow of water through a sand filter for the purpose of cleaning it.

BASE

A chemical which neutralizes acids by releasing hydroxyl ions in a water solution. A chemical which raises the pH when added to swimming pool water. Examples of bases are sodium carbonate (soda ash) and sodium hydroxide (caustic soda commonly known as lye).

BACTERIA

Single-celled microorganisms. Some bacteria are beneficial yet many others are capable of causing disease.

BREAKPOINT

The process of adding chlorine to pool water in large doses to oxidize organic material and destroy chloramines.

BROMAMINES

Hypobromous Acid (HOBr) combined with ammonia products. Bromamines have no noticeable odour, do not cause eye irritation and have equal disinfecting power as HOBr.

BUFFER

A chemical when dissolved in swimming pool water will resist pH change. Sodium bicarbonate (NaHCO_3) is this type of chemical.

CALCIUM HYPOCHLORITE

A compound of chlorine and calcium used in white granular form as a disinfectant in pools. In water solution it releases 65% to 70% of its weight as available chlorine. Calcium hypochlorite must be handled with care.

CHLORAMINES

Compounds that are produced when ammonia compounds react with FAC. Chloramines produce the obnoxious chlorine odours associated with pools and greatly reduces the disinfecting power of chlorine. Chloramines may also cause skin, eye and respiratory irritations.

CHLORINE

Used in swimming pools as a disinfectant and algicide. Extreme caution must be used when handling. Available in the inorganic form as gas, liquid, and hypochlorite and in the organic form of chlorinated cyanurates.

CHLORINE DEMAND

The amount of chlorine required to destroy infectious agents, algae and/or other organic and inorganic material in water before an available chlorine residual can be achieved.

CLARITY

The state of clearness of pool water which can be demonstrated by how easily and clearly an object can be seen in a given depth of water. A good test for clarity is the ability to see the main drain cover from anywhere on the pool deck.

COLIFORM ORGANISMS

Bacteria found in the intestines of warm-blooded animals. Their presence in pool water indicate the possibility of the presence of disease-causing bacteria.

COMBINED AVAILABLE CHLORINE (CAC)

See definition of chloramines.

CONTAMINATED

Impure. Can refer to the presence of harmful infectious agents in water, or to the presence of any unwanted substance.

CYANURIC ACID

A chemical that combines with available chlorine in pool water to prevent rapid loss of chlorine due to ultraviolet radiation from sunlight.

CYST

An infectious parasitic stage, which has a thick outer wall making disinfection of pool water difficult.

DIATOMACEOUS EARTH (DE)

A white porous powder used as a filter media composed of fossilized skeletons of one-celled organisms called diatoms.

DIATOMACEOUS EARTH FILTER

A vacuum or pressure filter designed to use DE as a filter media.

DIATOMITE

Common name for diatomaceous earth.

DISINFECTANT

A chemical which will destroy infectious agents.

DOWNWASH

The process of removing debris from pipes after backwashing filters. This backwash effluent is drained to waste before beginning a new filter run.

EFFLUENT

The outflow of water from a filter, a pump or a pool.

FILTER ELEMENT

The part of a diatomite filter, usually made of cloth, wire screen or other fine mesh material, which collects diatomaceous earth for filtration purposes.

FOLLICULITIS

An infection of hair follicles of the body which can be caused by *Pseudomonas* bacteria.

FILTER RATE

The volume of water which passes over a filter surface area during a given period of time. The filter rate is commonly expressed in litres per minute per metre squared (Litres/minute/m²).

FILTER RUN

The operational time of a filter between backwashes.

FILTER SAND

A filter medium found in sand filters composed of hard, sharp silica, quartz, or similar particle with proper grading for size and uniformity.

FLOCCULENT

A compound used with sand filters to form a thin gelatinous layer called floc on the top of the sand. The floc produces aids in trapping fine suspended particles which might normally pass through the sand medium.

FLOW RATE

The volume of water which flows past any point in the recirculation system during a given period of time. Flow rate is usually expressed in litres per minute (LPM).

FREE AVAILABLE CHLORINE (FAC)

The concentration (ppm) of chlorine in swimming pool/whirlpool water that is ready and available for disinfection.

GUTTER

Overflow trough located at the edge of a pool. Designed for continuous removal of surface water and floating debris from a pool.

HARDNESS

Refers to calcium and other dissolved minerals including magnesium which may cause scale build-up in the recirculation equipment.

HYDROCHLORIC ACID

Also called MURIATIC ACID when diluted. A strong acid used to lower pH, lower total alkalinity and occasionally used for cleaning purposes.

Caution: Use extreme care and protective equipment when handling.

HYDROGEN ION (H⁺)

The positively charged nucleus of a hydrogen atom. Its' presence in water solution is used as a measure of acidity of the solution.

HYPOBROMOUS ACID (HOBr)

A disinfectant that is formed when bromine products are added to water.

HYPOCHLORINATOR

An adjustable chemical feeder which feeds liquid chlorine solutions into the pool water at a given rate.

HYPOCHLOROUS ACID (HOCl)

A very effective disinfectant, oxidant and algicide.

IMPELLER

The rotating vanes of a centrifugal pump.

INFECTIOUS AGENTS

Harmful microorganisms that are capable of causing disease. They include bacteria, viruses, fungi and protozoa.

INFLUENT

Water flowing into a pool, a pump, a filter, a chemical feeder, or other equipment.

LIFELINE

A rope line across a pool to designate a change in slope in the pool bottom, or the beginning of deep water. It is usually supported by regularly spaced floats.

LINT STRAINER

A basket located at the pump influent line used to screen out lint and other debris which might cause damage to the pump.

LIQUID CHLORINE

In swimming pool terminology, sodium hypochlorite (NaOCl) solutions are known as liquid chlorine.

MACROCONIDIA

A network of microscopic plant life fibres that contain fungal spores.

MURIATIC ACID

A dilute solution of hydrochloric acid.

ODOURS

Usually the result of chloramines or sulphur in water.

OOCYST

An infectious parasitic stage of *Cryptosporidium* protozoa. An oocyst has a thick and environmentally resistant outer wall that makes disinfection very difficult.

OPEN SORES

Non-intact skin associated with drainage, i.e. a wet sore.

ORGANIC BROMINE

A disinfectant in the form of small, white, slow-dissolving pucks.

OVERSTABILIZED POOL WATER

A condition resulting from adding too much cyanuric acid to pool/whirlpool water. Overstabilized pool water reduces the disinfecting power of chlorine and is usually greenish in colour.

OZONE (O₃)

Used in swimming pools/whirlpools to **OXIDIZE** organic contaminants.

pH

The logarithm of the reciprocal of the hydrogen ion concentration of water solution. A measure of the balance between acidity and basicity (alkaline qualities) of a solution. A pH below 7.0 is considered acidic. A pH of 7.0 is considered neutral. A pH above 7.0 is considered alkaline.

PHENOL RED

An organic dye which is yellow at a pH of 6.8 and turns progressively deeper red in colour as the pH increases to 8.4. The most commonly used test reagent for pH in pools.

ppm

Parts per million or milligrams per litre.

PRECIPITATE

Any compound which comes out of solution as a chemical reaction and remains insoluble (i.e. calcium carbonate).

PRECOAT

The layer of diatomaceous earth deposited on filter septums at the start of a filter run.

SAND FILTER

A pool filter using sand, or sand and gravel as a filter medium.

SCALE

The mineral deposits or precipitant, usually calcium carbonate, caused by hard water, on the floors, walls, metal piping, filter system, etc., which can become unsightly and may interfere with the proper operation of the pool.

SKIMMER

A part of the recirculation system which continuously removes surface water and floating debris from a pool.

SKIMMER WEIR

The part of a skimmer which assures a continuous flow of water to the skimmer and which prevents oils and debris from returning back to the pool.

SODIUM BICARBONATE (NaHCO_3)

Baking soda. Very effective in alkalinity control. Sodium bicarbonate increases the alkalinity rapidly and the pH less rapidly.

SODIUM CARBONATE (Na_2CO_3)

Soda ash, used to raise pH and slightly increase total alkalinity in pool water.

SODIUM HYPOCHLORITE (NaOCl)

A liquid chlorine solution containing 12% to 15% available chlorine.

SODIUM THIOSULPHATE

A chemical solution used to neutralize chlorine from a test sample to avoid false pH test readings, or false bacteria test results. If used correctly, sodium thiosulphate can also lower chlorine concentrations in swimming pool/whirlpool water.

SPORES

Single-celled resistant bodies produced by fungi.

TITRATION

A method of testing for total alkalinity, hardness, etc. Also for making determinations as to the amount of acid which may be safely added to lower pH.

TOTAL ALKALINITY

See Alkalinity.

TOTAL AVAILABLE CHLORINE (T.A.C.)

Is equal to the free available chlorine plus combined available chlorine.

TOTAL BROMINE RESIDUAL

Hypobromous Acid (HOBr) + Bromamines

TURBIDITY

The quantity of suspended particles in pool water that leads to cloudiness.

TURNOVER RATE

The number of times a quantity of water equal to the total capacity of the pool passes through the filters in a stated time. Usually referred to as turnovers per day.

UNDERDRAIN (COLLECTION MANIFOLD)

The piping system located at the bottom of a sand filter which collects the filtered water during a filter run, and distributes the backwash water during backwashing.

VACUUM FILTER

Diatomite filter located before the pump in a recirculation system. Water is drawn through the filter rather than being pushed causing a vacuum.

VOIDS

Areas between particles or fibres of a filtering medium which determines the permeability and the dirt holding capacity of the filter.



Guidelines for
Applying the Public Pool
Bacteriological Standards

Public Health Division
Department of Health and Community Services

2019

These *Guidelines for Applying the Public Pool Bacteriological Standards* are to be used by Environmental Health Officers when interpreting bacteriological water quality sample results. Bacteriological samples are not required to be collected during routine public pool inspections, but may be necessary as part of an investigation of recreational water illness.

BACTERIOLOGICAL STANDARDS

Disinfection is a process in which pathogenic (disease causing) micro-organisms are removed or inactivated so that they represent no significant risks of infection.

The large number of visitors to swimming pools and the resulting load on the water in a confined space makes them potential sources of substances and micro-organisms harmful to health. Regular monitoring of the water quality in the swimming pools is therefore essential.

The bacteriological standards for public pools operating in Newfoundland and Labrador are contained in the document *“Public Pools: Water Quality Standards and Record Keeping”*. The following table is an excerpt from the document.

Table 1: Public Pool Bacteriological Standards

Test	Standard	Comment
<i>E. coli</i>	0 <i>per 100 ml sample</i> <i>Note: repeat sample must be taken to confirm presence of E. coli</i>	Indicator of the effectiveness of disinfection and recent fecal contamination
<i>Staphylococcus aureus</i>	50 or fewer <i>per 100 ml sample</i> <i>Note: repeat sample must be taken to confirm presence of Staphylococcus aureus at a level above the standard</i>	Indicator of water contamination
<i>Pseudomonas aeruginosa</i>	10 or fewer <i>per 100 ml of sample</i> <i>Note: repeat sample must be taken to confirm Pseudomonas aeruginosa at a level above the standard</i>	This organism is a pathogen in pools, spas and whirlpools.
Standard Plate Count	250 or fewer per 1 ml of sample Note: repeat sample to confirm SPC at a level above the standard	Indicator of a deficiency in the treatment process

Organisms/Tests:

- E. coli.* The presence of *E. coli* in public pool water samples indicates recent fecal contamination of the swimming pool water. The presence of the indicator bacteria *E. coli* means that other organisms which cause disease in humans may be present in the pool water. These organisms could cause gastrointestinal illnesses.
- Pseudomonas aeruginosa.* The presence of *P. aeruginosa* indicates that this pathogen is surviving in pool water. *P. aeruginosa* is a human pathogen. The presence of this species in pool water may lead to infections such as otitis externa (swimmer's ear) and folliculitis/dermatitis.
- Staphylococcus aureus.* Staphylococci organisms are routinely shed into pool water by bathers. The throat, nasal passages and skin of a portion of the population carry *S. aureus*. In pools *S. aureus* can cause skin rashes, infection of wounds, eye infections and other infections.
- Standard Plate Count: The Standard Plate Count (SPC) gives an indication of overall pool hygiene. High SPC detected in pool water that has had historically low SPC may be an indication of ineffective disinfection and cleaning.

RESULTS

A. INITIAL SAMPLE RESULTS:

The following steps are to be followed by the Environmental Health Officer upon receipt of the initial bacteriological sample results.

1. Immediately inform the pool operator of any unsatisfactory sample results.
2. Immediately inform the operator that you will be collecting repeat samples for the parameter(s) with unsatisfactory results.

Remedial Action

- examine the swimming pool chemistry
- check disinfection system
- check re-circulation system
- maximize disinfection (e.g., achieve a chlorine residual of 3.0 ppm); and
- ensure adequate water turnover

3. Inform the operator that remedial action can be taken prior to the repeat samples being collected.

Remedial action can also include superchlorination. Instructions for superchlorination are attached in Appendix B.

4. Collect repeat samples for the parameter(s) with unsatisfactory results **as soon as is practically possible**.

The period of time between the initial sampling results being known and the collection of repeat samples should not be greater than **two weeks**.

5. Mail satisfactory initial bacteriological results to the public pool operator.

Repeat Samples

Unsatisfactory initial bacteriological sample test results must be confirmed with the collection of repeat samples for the parameters with initial unsatisfactory results.

B. REPEAT SAMPLE RESULTS:

The following steps should be carried out by the Environmental Health Officer following receipt of bacteriological results from repeat samples.

1. *E. coli*.

Satisfactory Repeat Sample Results:

If the *E. coli* results are satisfactory, inform the public pool operator that the repeat samples were satisfactory.

Given that the operator will likely be anxiously awaiting the repeat sample results, the EHO should telephone or fax the results to the operator. A copy of the results should also be mailed to the operator.

Unsatisfactory Repeat Sample Results:

- i) Immediately inform the pool operator of any unsatisfactory sample results.
- ii) Inform the operator that due to the repeated detection of *E. coli* in the water, the pool must be closed until such time as:
 - the operator examines the disinfection, filtration and re-circulation systems and makes any necessary adjustments.
 - the operator evaluates the pool water chemistry and makes any necessary adjustments.
 - the operator superchlorinates the pool water.

Provide written confirmation of the bacteriological results and the closure to the pool operator within 24 hours. A copy of the letter should be provided to the Manager of Operations or the Regional Director of the Government Service Centre and the Medical Officer of Health (Appendix A.).

- iii) Provide instruction for the cleaning and super-chlorination of pool (Appendix B).
- iv) Upon notification from the pool operator that cleaning and super-chlorination has been completed, the Environmental Health Officer should follow the procedure outlined in Sections B.5 & B.6.

2 *Pseudomonas aeruginosa*

The bacteriological standard for *Pseudomonas aeruginosa* in public pool water is 10 or fewer colony forming units (cfu) per 100 ml of pool water. Public pools with greater than 50 cfu/100ml would be considered to have gross contamination.

Satisfactory Repeat Sample Results:

A repeat sample with 10 or fewer *P. aeruginosa* is considered acceptable and would not warrant additional steps. Samples are to be collected for *P. aeruginosa* during the next routine public pool inspection.

Unsatisfactory Repeat Sample Results:

Repeat sample results between **11 and 50 cfu/100ml** should be provided to the operator immediately upon receipt. *P. aeruginosa* results in this range requires the operator (and EHO) to review the operation of the pool in an effort to determine the areas where *P. aeruginosa* may be growing.

Why 50 cfu/100ml?

With numbers as high as 50 cfu/100ml there is real risk of a rapid increase in numbers to much higher levels where the risk of disease could become significant (U.K. Health Protection Agency)

Repeat sample results of **greater than 50 cfu/100ml** requires the following steps to be carried out:

- i) Immediately inform the pool operator of the sample results.
- ii) Inform the operator that due to the repeated detection of *P. aeruginosa* in large numbers in the pool water, the pool must be closed until such time as:
 - the operator examines the disinfection, filtration and re-circulation systems and makes any necessary adjustments.
 - the operator evaluates the pool water chemistry and makes any necessary adjustments.
 - the operator carries out thorough cleaning of the pool, including pool decks and equipment.
 - the operator superchlorinates the pool water.

Provide written confirmation of the bacteriological results and the closure

to the pool operator within 24 hours. A copy of the letter should be provided to the Manager of Operations or the Regional Director of the Government Service Centre and the Medical Officer of Health (Appendix A.).

- iii) Provide instruction for the cleaning and super-chlorination of pool (Appendix B).

What to do?

When *P. aeruginosa* gets established in a pool it will be necessary to **clean** and **disinfect** both the **pool basin** and the **re-circulation system**.

- iv) Provide the instructions (Appendix D) for dealing with *P. aeruginosa* in pools.
- v) Upon notification from the pool operator that cleaning and super-chlorination has been completed, the Environmental Health Officer should follow the procedure outlined in Sections B.5 & B.6.

3. *Staphylococcus aureus*

As mentioned previously, *S. aureus* is commonly found as part of the normal bacterial flora of the nose, skin and throat of people. Thus *S. aureus* is easily shed into pool water by bathers. Typical chlorine disinfectant residual levels of 1.0 ppm or greater should be enough to rid the pool of any *S. aureus* that is shed.

Satisfactory Repeat Sample Results:

A repeat sample with 50 or fewer *S. aureus* is considered acceptable and would not warrant additional corrective action. Samples are to be collected for *S. aureus* during the next routine public pool inspection.

Unsatisfactory Repeat Sample Results:

Repeat sample results of **greater than 50 cfu/100ml** requires the following steps to be carried out:

- l) Immediately inform the pool operator of the sample results.

- ii) Inform the operator that due to the repeated detection of *S. aureus* in large numbers (>50cfu/100ml) in the pool water, the pool must be closed until such time as:
- the operator examines the disinfection, filtration and re-circulation systems and makes any necessary adjustments.
 - the operator evaluates the pool water chemistry and makes any necessary adjustments.
 - the operator carries out thorough cleaning of the pool, including pool decks and equipment.
 - the operator superchlorinates the pool water.

Provide written confirmation of the bacteriological results and the closure to the pool operator within 24 hours. A copy of the letter should be provided to the Manager of Operations or the Regional Director of the Government Service Centre and the Medical Officer of Health (Appendix A.).

- iii) Provide instruction for the cleaning and super-chlorination of pool (Appendix B).
- iv) Upon notification from the pool operator that cleaning and super-chlorination has been completed, the Environmental Health Officer should follow the procedure outlined in Sections B.5 & B.6.

4. Standard Plate Count

The Standard Plate Count (SPC) test is useful in judging the efficiency of water treatment.

Satisfactory Repeat Sample Results (SPC <= 250):

A repeat sample with a SPC of 250 or fewer is considered acceptable and would not warrant additional corrective action. Samples are to be collected for SPC during the next routine public pool inspection.

Unsatisfactory Repeat Sample Results:

A repeat sample with a SPC of greater than 250 is an indication that the pools disinfection system is not operating efficiently and optimally and that there is a problem with pool chemistry.

- i) Inform the pool operator of the unsatisfactory sample results.
- ii) Inform the operator that due to the repeated detection of a high SPC in the water, the following should be carried out:
 - An examination of the disinfection, filtration and re-circulation systems. Makes any necessary adjustments.
 - An evaluation of the pool water chemistry. Makes any necessary adjustments.

5. Procedure Following Cleaning and Superchlorination

- Carry out an inspection of the pool to ensure cleaning and disinfection instructions were carried out and that the pH and chlorine levels are acceptable.
- In the absence of disease, and if the Environmental Health Officer is satisfied that the instructions were carried out, and he/she is confident with the operator's history of pool operation procedure, the pool can be reopened prior to obtaining satisfactory bacteriological sample results. This will eliminate any undue time delays that may be encountered due to having samples delivered to the laboratory for testing.
- **Follow-up samples** are to be collected and submitted to the Public Health Laboratory as soon as practically possible.
- Provide notification of the pool re-opening to the Government Service Centre Manager of Operations or Regional Director and the Medical Officer of Health.

6. Procedure Upon Receiving Follow-up Sample Results:

- If sample results are satisfactory for *E. coli*, *Pseudomonas* and *Staphylococcus* no further action is required.
- If the sample results are unsatisfactory for *E. coli*, *Pseudomonas* and *Staphylococcus* the Environmental Health Officer shall:
 - Immediately instruct the operator to close the pool. The pool closure will remain in effect until satisfactory bacteriological water results are obtained from the pool.

Pseudomonas aeruginosa:

Where *P. aeruginosa* is not removed by cleaning and disinfection, it may be necessary to **clean the filter** by removing the filter media and possibly replacing the filter media.

- Instruct the operator to repeat the cleaning and disinfection procedures re-emphasizing the need for thorough cleaning.
- Provide notification of the pool closure to the Manager of Operations or the Regional Director of the Government Service Centre and the Medical Officer of Health.
- The pool will remain closed until satisfactory bacteriological results are obtained.

Appendix A

Pool Closure Notification Letter

Appendix A

Note: Send by registered mail

Date:

Address:

Re:

On *(enter date of laboratory confirmation)*, the Government Service Centre received confirmation that samples collected from *(enter the name of the public pool)* in *(enter name of community)* on (enter date of sample collection) were found to be unsatisfactory. The unsatisfactory sample results are provided below.

Sample Location	Unsatisfactory Bacteriological Sample Results		
	<i>E. coli</i>	<i>Pseudomonas aeruginosa</i>	<i>Staphylococcus aureus</i>

Based on the above test results the pool does not comply with satisfactory bacteriological quality component of section 13 of the Newfoundland and Labrador Public Pool Regulations 1023/96. Under the authority of Section 6 (6) of the Newfoundland and Labrador Public Pool Regulations 1023/96, you are hereby ordered to immediately close the above noted facility to the public.

The facility shall remain closed to the public until approved for re-opening by the undersigned.

If you have any questions, please contact me at (enter telephone # of EHO).

Environmental Health Officer

cc Regional Director, GSC
Health & Community Services
Medical Officer of Health

Appendix: B

Cleaning and Disinfection

Procedures

for

Public Pools

**Appendix B1: Cleaning and Disinfection Procedures for Swimming Pools,
except Class B Whirlpools and Spa type pools.**

1. Clean the pool walls above and just below the pool water level. Backwash the filters.
2. Lower the pH of pool water by 0.3 units to anticipate the effects of Super-chlorination on the pool pH level.
3. Super-chlorinate (shock) the pool by raising the Free Available Chlorine to a minimum of 10 ppm and maintaining it for a specific period of time that will achieve a CT value of 10,000. This can be calculated by:

$$\text{Chlorine Concentration (ppm)} \times \text{Time (minutes)} = 10,000$$

Concentration (ppm)	Time
10	17 hours (1020 minutes)
20	9 hours (540 minutes)
30	6 hours (360 minutes)
40	4 hours (240 minutes)
50	3 hours (180 minutes)

4. Shock the pool water using calcium hypochlorite. This may be applied directly to the pool in dry form by hand, broadcasting the product evenly over the water surface.

The following formulas can be used to determine the amount of calcium hypochlorite (65%) required to raise the free available chlorine (FAC) :

$$\text{(desired FAC)} \times \text{(1.5 grams)} \times \frac{\text{total pool volume in litres}}{1000 \text{ litres}}$$

or
$$\text{(desired FAC)} \times \text{(2 ounces)} \times \frac{\text{total pool volume in gallons}}{10,000 \text{ gallons}}$$

Example: To raise FAC to 20 ppm in a 200,000 litre pool:

$$20 \times 1.5 \text{ grams} \times \frac{200,000 \text{ l}}{1000 \text{ l}} = \text{6000 grams or 6 kg}$$

Note: Shocking outdoor pools is most effective when conducted later in the day to reduce the effects of direct sunlight on chlorine levels.

5. Sanitize the pool deck using a chlorine disinfectant solution with ½ cup sodium hypochlorite in a gallon of water or 1 oz of calcium hypochlorite in a gallon of water.
6. After achieving the desired contact time for shocking the pool, the free available chlorine level of the pool must be reduced to around 5 ppm.

e.g. to lower the chlorine level 1ppm, 35.3 grams of sodium sulphite per 20,000 litres of pool water or 2.4 oz per 10,000 gallons of pool water

Appendix: B2 Cleaning and Disinfection Procedures for Class B Pools: Whirlpools and Spa type pools.

1. Turn the heater off. Wait until the heater unit has cooled.
2. Drain the pool. Use protective rubber gloves and a face mask when working around the tank and mechanical equipment.
3. Backwash the filter.
4. Clean the pool basin with a mild tub and liner cleaner. Ensure that all grease and scum is removed. Rinse the cleaner to drain.
5. Fill the pool to the halfway point to the skimmer mouth ensuring that the air lines of the hydro jets are flooded.
6. Lower the pool water pH to below 7.0
7. Super- chlorinate (shock) the pool water to a free available chlorine level of 50 ppm using sodium hypochlorite.

e.g. 250 ml sodium hypochlorite (10.3 %) for every 1000 litres of water
500 ml sodium hypochlorite (5 %) for every 1000 litres of water
8. Turn off all equipment that functions when the filter pump is on (i.e. chemical feeders, pH controller and other chemical controllers).
9. Turn the filter pump on and circulate for a minimum of two and a half hours.
10. Turn the hydro jet pump on for a minimum of 20 minutes.
11. Disinfect the deck area surrounding the pool with a 100 ppm chlorine solution.

e.g. 50 ml (5%) bleach per litre of water or 1 cup per gallon of water.
12. At the end of the two and a half hours, backwash the filter.
13. Drain the pool and hydro jet lines.
14. Refill the pool and immediately repeat backwashing the filter.
15. Top up the pool water level and turn on any equipment which functions with the filter pump.
16. Balance the water chemistry by using the approved test kit. A Langelier Index between +0.3 and - 0.3 is acceptable. 0.0 is optimum.
17. Maintain the required disinfection level . A free available chlorine residual of to 3.0 ppm or a total bromine residual of 2.0 to 4.0 ppm is recommended. Do not exceed a combined chlorine residual of 0.5 ppm.

APPENDIX C

OUTDOOR POOL OPENING & CLOSING PROCEDURES

Source: Illinois Swimming Pool Operator Certification Course Manual
Illinois Department of Public Health

Appendix C:

Pool Opening Procedures

1. Approximately one month prior to opening the swimming pool, examine the pool walls, bottom and deck and repair any chips and cracks.
2. Flush all lines leading to and from the pool with fresh water. The pool design will dictate which method you will use, either a garden hose or other mechanical means.
3. Thoroughly clean the pool walls and bottom.
4. To remove stains, clean the surface with a mixture of calcium or sodium hypochlorite and water. Rinse well with water after use.
5. Remove any scaling paint and if necessary, paint the pool a light color.
6. Refill the swimming pool after the paint is dry and remount diving boards, ladders, etc.
7. Re-install all equipment and piping that was removed and operate all valves to assure they are in proper operating condition. Repair and lubricate them as necessary.
8. Place the re-circulation system in operation and backwash the filter. Operate the filter.
9. Check the chemical feeder and place it in operation. Check all gauges and flow meters for operation and accuracy.
10. Test the pH and maintain it between 7.2 and 7.8. Test the free chlorine residual and adjust it to around 1.5 ppm for indoor pools and 3.0ppm for outdoor pools.
11. Operate the re-circulation and disinfection systems continuously.

Appendix C: Outdoor Pool Closing Procedures

To protect outdoor pools from damage due to severe weather, precautions must be taken at the time of the pool closing.

1. Thoroughly clean and grease unprotected metal parts of chemical feeders to protect against rust and corrosion.
2. Remove and drain all water from flow meters following the manufacturer's instructions and store in a warm dry area. Attach instructions for reinstallation.
3. Pressure gauges should be removed and stored in a warm dry area.
4. Filters must be backwashed thoroughly.
5. Completely drain filter shells and examine thoroughly for any repair and painting needs.
6. Diatomaceous earth (DE) filter elements must be cleaned and carefully examined for breaks or deterioration. If new elements are needed, they must be ordered for next season's opening.
7. When preparing the re-circulation pump for the pool closing, the pump impeller casing must be drained and examined for wear. Order new parts if necessary.
8. Clean and lubricate the pump following the manufacturer's instruction. Cover the electric motor to protect it from moisture or remove and store in a warm dry area.
9. Drain all lines subject to freezing such as lines to the pool inlets, city water lines to the toilets, drinking fountains, showers, etc.
10. Drain all flush tanks on the toilets and urinals, the hot water heater and water storage tanks.
11. Drain mixing basins, filter piping, hair and lint strainers, and chemical solution tanks. Drain all water from suction cleaner hoses and store in a warm dry area.
12. Remove and store outside drinking fountains or cover them for protection.
13. Remove the diving boards and store them on a flat surface to prevent warping.
14. Identify and clearly label left over chemicals and store in a dry storage space accessible only to authorized personnel.
15. Leaving water in the pool or completely draining the pool is optional. If water is left in the pool, the water level must be lowered to at least six inches below the side wall inlets.
16. If the pool is completely drained, check the operation of the hydrostatic relief valve in the deep portion of the pool or the under-drain system if provided. This will protect the pool structure from damage that could occur from a high water table in the spring.

APPENDIX D

Pseudomonas aeruginosa

Contamination

in

Hot Tubs

Source: **Swimming Pool / Hot Tub Basic Course**
Fraser Health Authority: Fraser Valley Area, British Columbia

A Cleaning Procedure for Treating the Presence of *Pseudomonas Aeruginosa* in Hot Tubs

Pseudomonas aeruginosa can survive in a hot pool and associated filtration equipment.

This micro-organism is largely responsible for eye and ear infections and skin rashes contacted from pool use. It enters the pool water through infected persons.

The conditions in a hot pool, including the high water temperature, turbulence, concentrations of hair, skin, body oils, pieces of clothing, organic matter, ammonia and other substances introduced by the users promote the growth of *Pseudomonas aeruginosa*. These conditions also create a high chlorine demand and it becomes difficult to maintain an adequate free chlorine residual in the pool water to combat pathogens entering the pool.

Once *Pseudomonas aeruginosa* has established its presence in a pool, the pool basin and recirculation system need to be cleaned and disinfected. The filter sand also becomes a growth area for pathogens.



Cleaning Procedures...

- Turn off the pool water heater and clean the hair and lint screens.
- Back wash the filter and drain the pool.

- Fill the pool with fresh water and lower the pH to below 7.0.
- Add enough sodium hypochlorite to the pool water to obtain a free chlorine residual of about 20 mg/L.
- Operate the recirculation system, passing all the pool water through the filter 3 or 4 times.
- Operate the hydro pump, if present, for a short time.
- Back wash the filter and drain the pool.
- Wipe down the whirlpool basin with a chlorine solution.
- Fill the pool with fresh water and chemically balance the water for pH, alkalinity, hardness, and free chlorine residual.
- Operate the recirculation system and adjust the pool water balance.
- **Contact your local Health Unit for sampling.**

Should the above method fail to eliminate *Pseudomonas aeruginosa* from the recirculation system, the operator will need to remove all the sand from the filter, clean the filter container and either physically clean or replace the sand.

PRECAUTION:

When cleaning hot tubs contaminated with *Pseudomonas Aeruginosa*, precautions should be taken to avoid contact with contaminated surfaces. It is recommended that rubber gloves be worn, as well as appropriate clothing, so as to avoid skin contact.



SEASONAL PUBLIC POOLS

Inspection & Licensing

Guidelines

**Department of Health and Community Services
Public Health Division**

January 2019

POLICY DIRECTION

Seasonal public pools operating in Newfoundland and Labrador must be inspected and be issued a valid Public Pool License prior to opening each season, or year, in accordance with the *Public Pools Regulations* under the *Health and Community Services Act*.

The inspection of seasonal public pools must evaluate the capability of the pool to be operated in accordance with the requirements of *the Public Pools Regulations* and applicable standards.

This document, *Seasonal Public Pools: Inspection & Licensing Guidelines*, is to be followed by the Environmental Health Officers (EHOs) with the Service NL.

INTRODUCTION

These guidelines provide direction with respect to opening certain seasonal public pools. These guidelines do not prevent Environmental Health Officers with the Government Service Centre of Service NL from arranging pre-opening inspections.

NOTIFICATION:

1. A letter (see Appendix A) that outlines the requirement for a “pre-opening” inspection and the issuance of a license prior to the seasonal pool opening for the season is to be sent to all seasonal public pool operators on or around May 1st each year.
2. Within one week of being notified, by the operator of a seasonal public pool, of the intention to open the pool for the season, the EHO will perform a “pre-opening” inspection of the seasonal public pool.

Inspection:

3. The EHO will conduct a complete inspection of the seasonal public pool to ensure compliance with the *Public Pools Regulations* and suitability for opening.

PHYSICAL AND CHEMICAL WATER QUALITY:

4. The physical and chemical quality of pool water must be assessed at the time of inspection.

BACTERIOLOGICAL WATER QUALITY:

5. Bacteriological samples are not required to be collected during routine public pool inspections. Sampling may be necessary as part of an investigation of recreational water illness. The bacteriological standards are provided below.

Test	Standard	Comment
<i>E. coli</i>	0 per 100 ml sample Note: repeat sample must be taken to confirm presence of <i>E. coli</i>	Indicator of the effectiveness of disinfection and recent fecal contamination
<i>Staphylococcus aureus</i>	50 or fewer per 100 ml sample Note: repeat sample must be taken to confirm presence of <i>Staphylococcus aureus</i> at a level above the standard	Indicator of water contamination
<i>Pseudomonas aeruginosa</i>	10 or fewer per 100 ml of sample Note: repeat sample must be taken to confirm <i>Pseudomonas aeruginosa</i> at a level above the standard	This organism is a pathogen in pools, spas and whirlpools.
Standard Plate Count	250 or fewer per 1 ml of sample Note: repeat sample to confirm SPC at a level above the standard	Indicator of a deficiency in the treatment process

OPENING AND LICENSING:

6. The *Public Pool Licence* and permission to open can be granted by the EHO at the completion of the inspection.

Permission to open can be granted provided that chemical water quality parameters are satisfactory and the EHO is satisfied that the pool is safe to open.

EHOs are to write on the *Public Pool Inspection Report* that the public pool is permitted to open and a new license will be issued.

If the results from the bacteriological samples, collected during an investigation of recreational water illness, are unsatisfactory, the actions/procedures outlined in the document “***Guidelines for Applying the Public Pool Bacteriological Standards***” are to be followed.

7. A *Public Pool License* should be forwarded to the operator as soon as practical following the completion of the inspection.

Appendix A

Letter to Seasonal Public Pool Operators

Appendix A

Subject: Pre-opening Inspection of Seasonal Public Pool: *(Enter Name of Pool)*

Dear Pool Operator:

According to my records, you operated a seasonal public swimming pool last summer. As the operator of a seasonal public pool in Newfoundland and Labrador, I would like to inform you of the requirement for an inspection to be carried out on your pool prior to the pool opening this season. If it is your intention to re-open your facility for the upcoming season, please contact me for a pre-opening inspection. The inspection will be conducted within one week of your call.

The inspection is necessary to determine if the swimming pool meets the requirements of the *Public Pools Regulations*, the *Public Pool Water Quality Standards* and is suitable for opening. A copy of the water quality standards is enclosed.

I have also enclosed a copy of the *Inspection and Licensing Procedures for Seasonal Public Pools* for your information. The document outlines the manner in which your pool will be opened this year.

I look forward to hearing from you in the near future regarding the opening of your seasonal swimming pool for the *(enter something like "summer of 2004")*. If you have any question at any time regarding the licensing and inspection of swimming pools, please do not hesitate to give me a call.

Sincerely yours,

Environmental Health Officer

Enclosures: Public Pool Water Quality and Record Keeping Standards
Seasonal Public Pools: Inspection and Licensing Procedures
Cleaning and Superchlorination Instructions
Procedures for Pool Opening

Appendix B

Cleaning and Disinfection
Procedures
for
Public Pools

Appendix B: Cleaning and Disinfection Procedures for Swimming Pools, except Class B Whirlpools and Spa type pools.

1. Clean the pool walls above and just below the pool water level. Backwash the filters.
2. Lower the pH of pool water by 0.3 units to anticipate the effects of Super-chlorination on the pool pH level.
3. Super-chlorinate (shock) the pool by raising the Free Available Chlorine to a minimum of 10 ppm and maintaining it for a specific period of time that will achieve a CT value of 10,000. This can be calculated by:

$$\text{Chlorine Concentration (ppm)} \times \text{Time (minutes)} = 10,000$$

Concentration (ppm)	Time
10	17 hours (1020 minutes)
20	9 hours (540 minutes)
30	6 hours (360 minutes)
40	4 hours (240 minutes)
50	3 hours (180 minutes)

4. Shock the pool water using calcium hypochlorite. This may be applied directly to the pool in dry form by hand, broadcasting the product evenly over the water surface.

The following formulas can be used to determine the amount of calcium hypochlorite (65%) required to raise the free available chlorine (FAC) :

$$(\text{desired FAC}) \times (1.5 \text{ grams}) \times \frac{\text{total pool volume in litres}}{1000 \text{ litres}}$$

$$\text{or } (\text{desired FAC}) \times (2 \text{ ounces}) \times \frac{\text{total pool volume in gallons}}{10,000 \text{ gallons}}$$

Example: To raise FAC to 20 ppm in a 200,000 litre pool:

$$20 \times 1.5 \text{ grams} \times \frac{200,000 \text{ l}}{1000 \text{ l}} = 6000 \text{ grams or } 6 \text{ kg}$$

Note: Shocking outdoor pools is most effective when conducted later in the day to reduce the effects of direct sunlight on chlorine levels.

5. Sanitize the pool deck using a chlorine disinfectant solution with ½ cup sodium hypochlorite in a gallon of water or 1 oz of calcium hypochlorite in a gallon of water.
6. After achieving the desired contact time for shocking the pool, the free available chlorine level of the pool must be reduced to around 5 ppm.

e.g. to lower the chlorine level 1ppm, 35.3 grams of sodium sulphite per

20,000 litres of pool water or 2.4 oz per 10,000 gallons of pool water

APPENDIX C

OUTDOOR POOL OPENING & CLOSING PROCEDURES

Source: **Illinois Swimming Pool Operator Certification Course Manual**
Illinois Department of Public Health

1. Approximately one month prior to opening the swimming pool, examine the pool walls, bottom and deck and repair any chips and cracks.
2. Flush all lines leading to and from the pool with fresh water. The pool design will dictate which method you will use, either a garden hose or other mechanical means.
3. Thoroughly clean the pool walls and bottom.
4. To remove stains, clean the surface with a mixture of calcium or sodium hypochlorite and water. Rinse well with water after use.
5. Remove any scaling paint and if necessary, paint the pool a light color.
6. Refill the swimming pool after the paint is dry and remount diving boards, ladders, etc.
7. Re-install all equipment and piping that was removed and operate all valves to assure they are in proper operating condition. Repair and lubricate them as necessary.
8. Place the re-circulation system in operation and backwash the filter. Operate the filter.
9. Check the chemical feeder and place it in operation. Check all gauges and flow meters for operation and accuracy.
10. Test the pH and maintain it between 7.2 and 7.8. Test the free chlorine residual and adjust it to around 1.5 ppm for indoor pools and 3.0ppm for outdoor pools.
11. Operate the re-circulation and disinfection systems continuously.

Appendix C: Outdoor Pool Closing Procedures

To protect outdoor pools from damage due to severe weather, precautions must be taken at the time of the pool closing.

1. Thoroughly clean and grease unprotected metal parts of chemical feeders to protect against rust and corrosion.
2. Remove and drain all water from flow meters following the manufacturer's instructions and store in a warm dry area. Attach instructions for reinstallation.
3. Pressure gauges should be removed and stored in a warm dry area.
4. Filters must be backwashed thoroughly.
5. Completely drain filter shells and examine thoroughly for any repair and painting needs.
6. Diatomaceous earth (DE) filter elements must be cleaned and carefully examined for breaks or deterioration. If new elements are needed, they must be ordered for next season's opening.
7. When preparing the re-circulation pump for the pool closing, the pump impeller casing must be drained and examined for wear. Order new parts if necessary.
8. Clean and lubricate the pump following the manufacturer's instruction. Cover the electric motor to protect it from moisture or remove and store in a warm dry area.
9. Drain all lines subject to freezing such as lines to the pool inlets, city water lines to the toilets, drinking fountains, showers, etc.
10. Drain all flush tanks on the toilets and urinals, the hot water heater and water storage tanks.
11. Drain mixing basins, filter piping, hair and lint strainers, and chemical solution tanks. Drain all water from suction cleaner hoses and store in a warm dry area.
12. Remove and store outside drinking fountains or cover them for protection.
13. Remove the diving boards and store them on a flat surface to prevent warping.
14. Identify and clearly label left over chemicals and store in a dry storage space accessible only to authorized personnel.
15. Leaving water in the pool or completely draining the pool is optional. If water is left in the pool, the water level must be lowered to at least six inches below the side wall inlets.
16. If the pool is completely drained, check the operation of the hydrostatic relief valve in the deep portion of the pool or the under-drain system if provided. This will protect the pool structure from damage that could occur from a high water table in the spring.



Public Pool
Bacteriological Water Sampling
Guidelines

**Public Health Division
Department of Health and Community Services**

2019

Bacteriological samples are not required to be collected during routine public pool inspections. Sampling may be necessary as part of an investigation of recreational water illness (RWI).

This document “Public Pool Bacteriological Water Sampling Guidelines” is to be followed by Environmental Health Officers when collecting water samples from public pools for bacteriological analysis.

1. When to Collect Samples:

The following points should be considered by Environmental Health Officers when inspecting public pools and collecting public pool water samples for bacteriological analysis.

- If possible, collect samples when swimmers are in the pool, preferably during periods of peak use.

Samples collected when no one is in the pool do not necessarily reflect the water quality when swimmers are in the water. There can be a sense of false security by just relying upon a sample taken when no one is in the pool.

- Collect samples within approximately the first five minutes after the swimmers have entered the water because the maximum amount of contamination exists during this period.

If the water quality under such extreme conditions is satisfactory, it is reasonable to assume that the water quality is satisfactory at other times when the bather use is less.

- Vary the hour of the day, or day of the week for collecting samples to obtain more representative sampling of the pool water quality.
- Test for chlorine residuals (free and total) and/or other disinfectant at every inspection, whether bathers are present or not. A lower than acceptable chemical residual (free available chlorine) indicates potential trouble with pool operations.

2. Where to Collect Samples:

- During the inspection collect samples from the shallow and deep areas of each swimming pool, and from wading pools, plunge pools and other pools (e.g., hot tubs).
- Water samples for microbiological examination should be taken from the vicinity of the outlet skimmer box or scum gutter to confirm that pool management practices are achieving the aim of providing safe pool water.

- Other samples can also be taken from around the inlet area, and the backwash water.

3. How to Collect Samples:

- Collect all swimming pool water samples in clean, special sterile bottles containing sodium thiosulfate, a chlorine neutralizer. These bottles are provided by the Public Health Laboratory.

Note: Sodium thiosulfate neutralizes the chlorine disinfectant. This neutralization of the chlorine must begin as soon as possible so that the chlorine does not kill the bacteria while the sample is delivered to the laboratory.

- Bottles must not be rinsed before collecting the water sample.
- The sample bottle must be kept closed until the EHO is ready to collect the sample.
- **Hold** the bottom of the bottle and remove the screw cap from the bottle and hold on to it with the open end facing down. Do not:
 - lay the cap down
 - touch the inside of the cap
 - put the cap in your pocket

Note: The inside of the screw cap or the mouth of the bottle must not be touched when collecting a water sample. In addition, do not allow the screw cap or mouth of the bottle to come into contact with any surfaces that may introduce contamination.

- All samples should be taken from below the water surface. **Plunge** the bottle, neck downward, 300 mm (12 in.) below the water surface.
- **Fill the bottle** at that depth with a **sweeping forward motion**, bringing the bottle up toward the water's surface. Avoid contamination from floating debris.
- Keep the bottle away from your other hand and body parts. Discard some water so that the bottle is filled to the neck of the bottle.
- Immediately **replace the cap** and ensure that it is on securely. Shake the bottle.
- **Complete the label** on the sample bottle and complete the requisition enclosed with the sample bottle.



Public Pool
Shower Facility
Guidelines

**Public Health Division
Department of Health and Community Services**

2019

This document “Public Pool Shower Facility Guidelines” is to be used by Environmental Health Officers with Service NL during the review of new applications for public pools. The document will provide guidance for regulatory authorities and pool operators to ensure the adequate availability of shower facilities in public pools.

Shower facilities should be provided for in accordance with the following statement and Table 1.

“A minimum of two (2) shower heads are to be provided for each sex. One (1) additional shower head for each sex shall be added for each additional fifty (50) male or female users.”

Table 1: Shower facilities required for public pools.

Male & female bathers	Number of showers for each sex
1 - 50	2
51 - 100	3
101 - 150	4
151 - 200	5
201 - 250	6

Source: Article XVII, 17.8.4, ANSI/NSPI-1 1991, American National Standard for Public Swimming Pools.

Universal showers may be offered as long as the total number of showers remains the same, and both sexes have access to the same number of showers.



Environmental Health Guidelines
for
HYDROTHERAPY POOLS

Public Health Division
Department of Health and Community Services

January 2019

Introduction:

Hydrotherapy pools are used for a wide range of therapeutic purposes including:

- injury or incapacity recovery
- fitness exercising

In addition to being used by well or injured people they can be used by people who have infectious disease and people who are immuno-compromised.

To minimize potential health risks to the users of hydrotherapy pools, it is essential to ensure that the hydrotherapy pool is subject to proper management, operation and maintenance.

Hydrotherapy pools vary from other public pools. They have a higher operating temperature and increased disinfectant levels. A higher disinfectant level is required to compensate for the accelerated loss of the disinfecting agent which dissipates due to the increased water temperature.

Summary of Regulatory Requirements:

Part A: General

1. Public pools, including a hydrotherapy pool, shall be equipped, maintained, operated and used, in a manner that shall not become a source of danger to health or safety of the users or to public health.
2. The water in a pool shall be kept clean, continuously disinfected, of safe and satisfactory bacteriological and chemical quality, maintained free from visible pollution.

The document ***Public Pool Water Quality and Record Keeping Standards*** contains disinfection, bacteriological, chemical and physical water quality standards for hydrotherapy pools.

Part B: Regulatory Requirements of the *Public Pools Regulations*

The following regulatory requirements for Class A and other Class B public pools also apply to hydrotherapy pools.

- water, other than clean and unpolluted water, shall not be permitted to enter the pool;
- all floors, interior walls and surfaces are capable of thorough cleaning and floors have non-slip surfaces;
- the outlet opening of all water pipelines serving the pool are covered with a satisfactory cover to prevent accidental entrapment of bathers;
- a water meter is provided; and
- mechanical disinfection equipment is installed.

Part C: Re-Circulation:

- The recirculation, filtration and chemical treatment system shall be such that, the volume of the entire pool contents are recirculated, replenished, filtered and treated at least once in every 30 minutes.
- The recirculation of water flow shall be measured by a suitably installed meter.
- Adjustable clean water inlets shall be provided and located:
 - to provide uniform circulation of water;
 - to prevent back-siphonage; and
 - submerged beneath the water surface of the pool
- Except for stoppage for necessary maintenance or repairs, when the pool is in operation, all pumps, disinfecting equipment, filters and chemical feeders shall remain in continuous operation throughout the entire 24 hours of each day, notwithstanding that the pool may be closed to the public for part of each day.
- Water filters shall be protected by strainers capable of preventing hair, wool, lint or other fibrous matter from reaching or obstructing the filter.

Note:

Hydrotherapy pools, spas and whirlpools which are drained and disinfected after each use are exempt from the requirement to have a:

- continuous disinfection system.
- water meter

Refer to the *Public Pools Regulations* for a complete list of public pool (hydrotherapy pool) regulatory requirements.



VIOLATION ORDER

[enter date]
[enter operator Name]
[enter operator Mailing Address]

Dear Mr./Ms. [enter operator name]

On [enter date of inspection] I conducted an inspection of your public pool [enter name of public pool] which is licensed under the *Public Pools Regulations* of the *Health and Community Services Act*.

At the time of the inspection, I observed a number of violations [reword as required] of the *Public Pools Regulations*. The violations were noted on a *Swimming Pool Inspection Form*, and discussed with [enter name of operator or other person] at the time of the inspection.

The following items were found to be in violation of the *Public Pools Regulations* under the *Health and Community Services Act*.

1. Record Keeping [this is an example]

Section 17 of the Public Pools Regulations CNLR 1023/96 states:

An owner and an operator of a public pool shall keep and maintain water quality records in relation to that public pool that are required by an inspector or a medical health officer.

As the operator of this public pool you must ensure that appropriate record keeping is being maintained to meet the requirements of the *Public Pool Water Quality & Record Keeping Standards*: Records must be retained for the following tests:

<u>Parameter</u>	<u>Parameter Testing Frequency</u>
▪ Chlorine	½ Hour before opening and every 4 hours thereafter
▪ pH	½ Hour before opening and every 4 hours thereafter
▪ Water Temperature:	½ Hour before opening and every 4 hours thereafter
▪ Total Alkalinity	Daily
▪ Calcium Hardness	Weekly

2. Safety [this is an example]

Section 16 of the Public Pools Regulations CNLR 1023/96 states:

- (14) *An owner and an operator shall ensure that*
 - (e) *a telephone is conspicuously located, accessible and available for emergency use.*
- (15) *An owner and an operator shall cause a sign to be prominently posted*
 - (a) *at the entrance to each shower area and at every entrance to the deck used by bathers, stating that each bather must take a shower before entering or re-entering the pool and pool deck area;*
 - (c) *bearing the words CAUTION - NO DIVING with the wording not less than 15 centimetres high, and in a conspicuous location and full view, where a pool has a maximum water depth of less than 250 centimetres.*

- (17) *An owner and an operator shall ensure that there are provided, in places conveniently located for emergency use*
- (a) *an electrically insulated or non-conducting reaching pole not less than 365 centimetres in length;*
 - (c) *2 buoyant throwing aids, each of which has securely attached to it a .60 centimetres diameter rope of a length not less than 1/2 the width of the pool, plus 3 metres.*
- (18) *An owner and an operator shall ensure that there is an identifiable room or area for the sole purpose of emergency care and this area shall contain*
- (a) *a spine board with working straps or a device designed for securely transporting a person who has incurred a spinal injury*

As the operator of this public pool you must ensure that **[these are examples]**:

- A telephone for emergency use is continually available near the pool deck.
- Signs are erected as required under *Section 16(15) of the Public Pools Regulations CNLR 1023/96.*
- A spine board with *working straps* is continually available near the pool deck in a defined emergency area.
- An electrically insulated reaching pole and 2 buoyant throwing aids, as outlined in *Section 16(17) of the Public Pools Regulations CNLR 1023/96,* are continuously available near the pool deck in case of emergencies.

3. Operation **[this is an example]**

Section 7 of the Public Pools Regulations CNLR 1023/96 states:

- (1) *A public pool shall be equipped, maintained, operated and used, in a manner that shall not become a source of danger to health or safety of the users or to public health.*

As the operator of this public pool you must ensure that:

- The pool deck and showering area floors are cleaned and disinfected at least daily to lessen the possibility communicable disease spread.

As the operator of **[enter name of public pool]** you are ordered to comply with the *Public Pools Regulations* by **[enter date of compliance]**. Failure to correct the violations by **[enter date of compliance]** may lead to the immediate closure of the pool and further legal action.

If you have any questions regarding this Violation Order, please do not hesitate to contact me at **[enter phone number]**.

Sincerely,

[name of EHO]
Environmental Health Officer

Cc **[enter name]**, Manager of Operations – Service NL
[enter name], Medical Officer of Health – **[enter regional health authority]**
[enter name], Environmental Health Manager - **[enter regional health authority]**

CLOSURE ORDER

[enter date]

[Enter name and address of pool operator]

Dear [enter name of operator]

This letter is a follow-up to an inspection I conducted on [enter date of inspection] of the licensed public pool [enter name of public pool] and my verbal order to close the public pool due to the following deficiencies:

[enter specific reason(s) for closing the pool].

The inspection and closure order was carried out under the authority of the *Public Pools Regulations* of the *Health and Community Services Act*. As the operator of the public pool you are required to comply with the requirements of the *Regulations*.

Section 7 states:

“A public pool shall be equipped, maintained, operated and used, in a manner that shall not become a source of danger to health or safety of the users or to public health.”

Section 13 states:

“The water in a pool shall be kept clean, continuously disinfected, of safe and satisfactory bacteriological and chemical quality, maintained free from visible pollution ...”

[Add/remove applicable sections as required]

Your public pool which was closed on [enter date], under the authority of section 6(6)(a) of the *Public Pools Regulations*, shall remain closed until deemed to be safe, by meeting the requirements of the *Regulations*, upon the completion of an inspection and satisfactory water quality testing.

Please contact me at [enter telephone number] when the deficiencies that led to the closure have been corrected to arrange for a compliance inspection.

If you have any questions regarding this written Closure Order, please contact me at [enter phone number].

Sincerely,

[name of EHO]
Environmental Health Officer

Cc [enter name], Manager of Operations – Service NL
[enter name], Medical Officer of Health – [enter regional health authority]
[enter name], Environmental Health Manager - [enter regional health authority]