Swimmers exposed to water through:
- Skin contact
- Inhalation
- Swallowing

Infections from contaminated water can happen in:
- Ear
- Gastrointestinal
- Respiratory
- Dermal
Gastrointestinal Illnesses (Fecal-Oral)

- Protozoa
  - Cryptosporidium
  - Giardia

- Bacteria
  - Shigella
  - E. coli

- Viruses
  - Norovirus
  - Adenovirus
  - Hepatitis A
Respiratory and Dermal Illnesses

- **Legionnaires’ disease**
  - Bacteria is transmitted from inhaled mists (spas, cooling towers, fountains)
  - Very severe with fatality rates ranging from 5%-30% in outbreaks

- **Skin infections**
  - Plantar warts
  - Athlete’s foot
  - MRSA
Chemical Concerns

- **Irritations**
  - Result in burns, rashes, & cancers
  - Can be caused by:
    - High concentrations of chemicals
    - Chemical reactions
    - Sensitivities

- **Asphyxiation**
  - Chemical and mechanical rooms generate toxic fumes
  - Niles, Michigan – April 2, 2017
    - 13 year old boy killed and 14 hospitalized
    - CO buildup in the pool room from the pool heater

Number of ED visits associated with pool chemicals — United States
Other Hazards

- Drowning
  - Approximately 10 people die each day from drowning in US
  - Leading cause of accidental death
- Slips, falls, collisions
- Electrocution
  - Poorly wired equipment
  - Lightning
- Entrapment (VGBA)
What Can Go Wrong?

https://www.youtube.com/watch?time_continue=1&v=THcbDDZAJoQ
Bodily Releases
Accidental Fecal Release (AFR)

For both formed-stool and diarrheal fecal incidents:

• Close pool to swimmers

• Remove as much fecal material as possible (net or bucket) - dispose in sanitary manner
  - Clean and disinfect item used to remove the fecal material (leave the net or bucket immersed in pool during disinfection)
  - Vacuuming stool from pool is NOT recommended

• Illness can spread even in well-maintained pools
  - Important to monitor chemical levels
Formed-Stool AFR: Giardia

- Raise free chlorine level and maintain for proper time. See chart.
  - For proper disinfection, maintain pool temperature at 77° F and at a pH of 7.5 or less
- Confirm filtration system is operating correctly
  - Establish and maintain a fecal incident log

<table>
<thead>
<tr>
<th>Free Chlorine Concentration (ppm)</th>
<th>Disinfection Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>45</td>
</tr>
<tr>
<td>2.0</td>
<td>25 – 30</td>
</tr>
<tr>
<td>3.0</td>
<td>19</td>
</tr>
</tbody>
</table>
Diarrheal AFR: Cryptosporidium

- Raise waters free chlorine level (refer to chart)
  - Maintain pool temperature at 77° F and at pH of 7.5 or less
- Confirm filtration system is operating correctly
  - Establish and maintain a fecal incident log
- Backwash filter
  - Discharge backwash water directly to waste
  - Do not return backwash through filter
  - Replace filter media where appropriate

- Chlorine kills germs, but it takes time
  - Correct levels of chlorine kills most RWI germs
  - However, some RWI germs are harder to kill
    - Crypto can survive for days in properly disinfected pool

<table>
<thead>
<tr>
<th>Time Required to Inactivate or Kill Crypto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Chlorine Concentration (ppm)</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>
Vomit in Pool Water: Norovirus

- Vomit in pool while swimming is common
  - If from swallowing too much water, vomit is probably not infectious
  - If stomach contents are vomited up, take immediate action

- Respond to true vomit incident as to a formed fecal incident

<table>
<thead>
<tr>
<th>Norovirus Kill or Inactivation Time for a Vomit Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Chlorine Concentration (ppm)</td>
</tr>
<tr>
<td>----------------------------------</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>3.0</td>
</tr>
</tbody>
</table>
Blood in Pool Water

- Germs found in blood (Hepatitis B virus, HIV) spread when infected blood get into our body and bloodstream
- Chlorine kills germs found in blood
- Per CDC, no instances of person becoming infected after exposure to blood in a pool
- Germs don’t survive long when diluted into properly chlorinated pool water
  - Swimmers want something done after blood spill
  - No public health reason to recommend closing pool after blood spill but some operators do so to satisfy swimmers
Bodily Fluids on Pool Deck

Blood, Vomit or Feces

• Block off area until clean-up and disinfection is complete

• Clean up & disinfect contaminated surfaces immediately

• Disinfect with 9 parts water to 1 part household bleach for 20 minutes
Joplin Pool Code

- Do Not Run On Deck!
- Do Not Swim Alone!
- No Pushing!
- Parents Are Responsible For Their Children’s Safety!
- Use Bathroom (Not Pool)!
- No Diving Off Shallow End!
- Do Not Leave Suit In House!
- No Rough Play!

Don’t DUCK The Rules!
**Code Updates**

- No operational changes will be made to the Joplin Pool Code.
- Contact Joplin Building Department before making substantial changes to existing pool or spas
- Submit architectural plans for:
  - New construction
  - Remodeling existing pools
- Finished product must be approved before pool permit can be issued
Joplin Pool Code

- Adopted February 1, 2008

- Applies to:
  - Public pools
  - Semipublic pools
    - Hotels, motels
    - Apartments
    - Schools
    - Community pools
    - Clubs

- Does **not** apply to private single-family residence pools
Pool Inspection

- City Official authorized to enter premise
  - Sample and analyze pool water – monthly
  - Safety inspection – yearly or as needed
Closure Items

- Disinfectant concentration
- Electrical
- Clarity
- Continuous disinfection
  - Pump not working
  - Feeder not working
  - Filter not working
- Supervision
- Other conditions
  - Pool enclosure
  - Bodily excretions in pool
  - Main drain/entrapment issue
  - Broken glass
Disinfectant Residual

*This violation requires pool to be closed*

- **Immediate closure** required if disinfectant levels fall below minimum or above maximum
  - Chlorine
    - Free Chlorine below 1 ppm or above 10 ppm
  - Bromine
    - Below 2 ppm or above 10 ppm

- **Immediate action** required if free chlorine levels above 5 ppm and below 10 ppm
Electrical Safety

*This violation requires pool to be closed*

- Presence of bare electrical wires or other obvious electrical deficiency

- All electrical installations shall conform to prevailing city code and requirements of appropriate regulatory agency
  - Ex: All receptacles within 20’ of inside walls of pool shall be protected by ground-fault circuit interrupter (Missouri Lodging Rule 19 CSR 20-3.050)
Clarity

*This violation requires pool to be closed*

- Pool water must be clear enough to see drain in deepest part of pool while standing on side of pool
Continuous Disinfectant

*This violation requires pool to be closed*

- All parts of pool water recirculation system must be kept in continuous operation, 24 hours a day
  - Pumps, filters, disinfectant feeders, flow indicators, gauges and related components
- Add disinfectant via automatic feeder
  - easily adjustable
  - provides continuous application of disinfectant
- Hand feeding is not allowed, with exception of super chlorination
Equipment Maintenance

- Equipment Maintenance
  - Operate and maintain equipment according to manufacturer’s instructions

- Treatment Equipment *This violation requires pool to be closed*
  - Pump, filter and disinfectant feeder must be kept in proper working order
Operator Accessibility

*This violation requires pool to be closed*

Supervision

- Pool operators must be onsite or immediately accessible
  - reached by phone and be onsite within reasonable time frame (10 min)
- Lifeguards must also be onsite, when required

Pool Operator

- Person knowledgeable in pool water testing and water treatment equipment
- Immediately accessible
- Pool operator instruction recommended
Pool Enclosure

*This violation requires pool to be closed*

- Pool perimeter fence must have **self-closing, self-latching gate** (Joplin Building Code, Section 305 ISPSC)
- Top of barrier shall be at least 48” above grade
- Openings in barrier shall not allow passage of 4” sphere
- Pedestrian access gates shall:
  - open outward away from pool
  - be self-closing and self-latching
Main Outlets

*This violation requires pool to be closed*

- Main drains must have anti-vortex covers or gratings
- Gratings and drain covers must not be removable without use of tools
- Broken main drain covers or grates must be repaired or replaced ASAP
  - Pool must be kept closed until approved main grate is properly installed
Pool Closure

- When pool is closed for any reason
  - All entry points properly secured against unauthorized entry
  - Post sign saying “Danger - Pool Closed” in plain view
- If pool/spa closed by Joplin Health Department, do not reopen until approved by JHD
- Failure to comply with pool closure requirements could result in fines and/or jail time

This document serves as written notice as required under Section 62-244 of ordinance number 2007-267.

☐ Pool Closure Required: Pool closure is required at this time. During pool closure the pool must remained secured against unauthorized entry and the proper pool closure signage must be posted. The pool shall remained secured until closure is rescinded by the Joplin Health Department. Failure to do so could result in fines up to $500 and/or up to 100 days in jail.
Notice of Violation and Penalty

- Notice of Violation (NOV)
  - Written NOV given to owner/responsible party
  - Maximum correction period up to ten (10) days unless granted an extension

- Penalty
  - Citation to municipal court if not corrected within time period
  - Subject to penalty under section 1-5 of the City Code of Ordinances upon conviction

*Ordinance #2007-267 Ch 62 Article VII Section 62-244 & 245*
IT WAS SPENCER’S FIRST TIME IN THE FREESTYLE EVENT

Break
Lifeguards

Lifeguard Staff

- Must be certified by American National Red Cross, National YMCA or equivalent
- Appropriate conduct and dress code
- On-duty lifeguards shall not engage in activities that distract from lifeguard duties
Safety Equipment

Lifesaving Equipment
- One unit of lifesaving equipment required per 2000 ft\(^2\) of water surface
- “Lifesaving Equipment Unit” defined as:
  - One throwing device
    - US Coast Guard approved ring or buoy
    - With cord ¼” diameter, 1.5 times pool width
  - AND One reaching device
    - Life pole or shepherds crook
    - Minimum length of 12 ft

Location
- Mounted in conspicuous and accessible places around pool deck
Lifeline & Boundary Marker

- Boundary line between shallow and deep end must be marked with:
  - 4” contrasting line on floors and walls, **and**
  - Safety rope (lifeline) with floats
  - Required where pool depth exceeds 5’

- Keep lifeline in place unless pool used for special purpose
Pool Decks

- Unobstructed deck 5’ wide shall surround pool
- Uniform, easily cleaned, impervious, slip-resistant
- Sloped away from the pool
Pool Structure

- Keep pool walls, floors, perimeter overflow systems and decks in good condition
- Do repairs on seasonal pools prior to opening
- Keep pool walls, floors, and decks painted to prevent corrosion
- Paint front edge of steps contrasting color
- Use light colors for pool structures
Hose Bib

Backflow prevention

- Provide hose bibs with backflow preventers for deck cleaning
- All hose bibs within deck area in use must have backflow prevention device
Free vs. Combined Chlorine

Joplin pools regulated on Free Chlorine (FC) levels

- Maintain FC between 1 ppm and 10 ppm
- **Ideal** FC levels are between 2 ppm and 4 ppm

Free Chlorine (FC)

- Portion of total chlorine (not combined chlorine) available to disinfect

Combined Chlorine (CC)

- Forms when chlorine bonds to urine, sweat, dead algae, etc.
- Not an effective disinfectant
- Causes eye and skin irritation
- Gives off strong chlorine-like odor
Super Chlorination

- If CC levels are above 0.5 ppm, super chlorinate the pool to reduce CC concentration
  - Combined Chlorine = Total Chlorine – Free Chlorine

- During super chlorination, raise FC levels about 10 times the amount of CC present in pool

- Do not allow swimmers in pool during super chlorination

- Keep swimmers out of pool until FC level is below 5 ppm

- Takes several hours for FC level to decrease
pH

JOPLIN POOL CODE REQUIRES pH TO STAY BETWEEN 7.2 AND 7.8.

- **LOW pH ISSUES**
  1. ETCHING OF POOL SURFACE
  2. CORROSION OF METALS
  3. EYE/SKIN IRRITATION
  4. CHLORINE LOSS
  5. STAINING ON SURFACE WALLS

- **HIGH pH ISSUES**
  1. CLOGGED FILTERS
  2. SCALING FROM CALCIUM PRECIPITATION
  3. CLOGGED FILTERS
  4. CLOUDY WATER
  5. CHLORINE INEFFICIENCY
  6. EYE/SKIN IRRITATION
pH and Chlorine

<table>
<thead>
<tr>
<th>pH</th>
<th>Chlorine</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>1.0 ppm</td>
</tr>
<tr>
<td>7.4</td>
<td>1.2 ppm</td>
</tr>
<tr>
<td>7.6</td>
<td>1.4 ppm</td>
</tr>
<tr>
<td>7.8</td>
<td>1.6 ppm</td>
</tr>
<tr>
<td>8.0</td>
<td>1.8 ppm</td>
</tr>
<tr>
<td>8.2</td>
<td>2.0 ppm</td>
</tr>
</tbody>
</table>
Bromine

- Maintain bromine levels above 2 ppm and below 10 ppm
- Must have a pH below 7.8
- **Ideal** bromine levels *4 ppm and 6 ppm*
Temperature and Alkalinity

Temperature

- Maintain pool temperatures between 72°F and 85°F
- Maintain spa temperatures below 104°F

Total Alkalinity

- Maintain pool alkalinity levels between 60 ppm and 180 ppm
Pool Chemical Safety Video

https://www.youtube.com/watch?v=pIm3yA61x-8
Water levels

- Add enough water to keep pool level high enough to reach skimmer at all times
Pool Water Inlets

- Must have enough working inlets to provide effective distribution of treated water throughout pool
- Maintain uniform level of disinfectant in pool
Pool Sides & Bottom

- Clean pool and deck on routine basis
- Brush and vacuum pool walls and bottom on daily basis
Ladders, Steps, Stairs

- Ladders or steps must be located in both shallow & deep ends
- Slip resistant
- Provide handrail for each ladder or step
Depth Markers

- Mark water depth on vertical pool wall or on the pool room wall as well as edge of pool deck

- Place markers
  - At changes in bottom slope
  - No more than 25’ apart
  - Both sides and both ends

- Letters must be minimum of 4” high in contrasting colors
Bather Load

- Post bather load sign in pool area

- Pool Area Loading
  - Shallow area is part of pool 5’ deep or less
    - Provide 15 ft\(^2\) of water surface per person
  - Deep area is part of pool 5’ deep or more
    - Provide 25 ft\(^2\) of water surface per person

- Spa Area Loading
  - Shall not exceed one person per 3 linear feet of seat or bench measured at front edge
Flow Meter

- Provides continuous indication of flow rate in gallons per minute (gpm) in recirculation system
- Mounted on return piping after other system components but before chemical feed injection
- Follow manufacturer’s installation directions
Turnover Rate

- Turnover rate = pool volume ÷ flow rate ÷ 60 min/hour

- Example: You have a 200,000 gallon pool with a flow rate of 750 gpm. What is the turnover rate?
  - TOR = 200,000 ÷ 750 ÷ 60 = 4.44 hours

- Flow rate = pool volume ÷ turnover rate ÷ 60 min/hour

- Flow rate may also be read from the FLOW METER
  - Pools
    - at least 4 complete turnovers in a 24-hour period
  - Wading pools
    - at least 1 complete turnover in 2 hours or less
  - Spas
    - at least 1 complete turnover in 30 minutes
Filters & Gauges

- Gauges
  - Correct placement & functioning correctly
  - Inspect on daily basis

- Filters
  - Good mechanical condition and functioning as designed
  - Backwash as needed
  - Replace filter media as needed
Test Kits

- Must be provided
  - For operator to monitor chemical levels
- Should be able to test for
  - Chlorine or Bromine
  - pH
  - Cyanuric Acid
  - Alkalinity
  - Calcium hardness
Records

- Operators must maintain daily operating logs
- Record relevant information for your pool
  - disinfectant levels, pH, equipment breakdown/repairs, amount of chemicals used, backwashing, fecal release incidents
- Pools at hotels/motels are required to maintain logs per Missouri Lodging Rule
- Keep logs available for viewing upon request
  - At least 3 months history available
# Daily Operating Log

## Pool Maintenance Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Total</th>
<th>Free</th>
<th>Combined</th>
<th>pH</th>
<th>Alkalinity</th>
<th>Calcium Hardness</th>
<th>Notes</th>
<th>Operator</th>
</tr>
</thead>
</table>

Recommended water chemistry: CHLORINE: Total - 5.0 ppm max; Free - 2 to 4 ppm; pH - 7.2 to 7.8; Alkalinity - 80 to 120 ppm; Calcium Hardness - 200 to 400 ppm

Daily Maintenance Logs and Self Inspection Forms available from JHD
Maintenance Best Practices

- Daily Items
  - Check chemical levels, water level, clarity, spa temperature
  - Vacuum as needed, check skimmer basket
  - Equipment function, pool enclosures

- Weekly Items
  - Backwash filter, check inlets flow and direction
  - Scrub pool and spa walls
  - Superchlorinate

- Monthly
  - Safety walk through (CO and smoke detectors, open wires, GFCI, signs)
  - Deck conditions
THE ROCK GOES TO THE POOL

@imthebirdguy
Entrapment - Types

- **Hair**: hair caught in faulty drain cover
- **Limbs**: arms, legs, fingers lodged in suction opening
- **Body**: any body part that covers a drain held by suction
- **Evisceration**: sitting on faulty drain cause injuries or disembowelment
- **Mechanical**: jewelry or bathing suits entangled in faulty drain cover
Virginia Graeme Baker (VGB Act)

- June 2002, 7 year-old died after entrapment on faulty drain cover in hot tub
- Virginia Graeme Baker Pool and Spa Safety Act (VGB Act)
  - Passed in December 2007
  - Effective December 2008
- Prevent drain entrapments & eviscerations in pools/spas

www.poolsafely.gov/pool-spa-safety-act/
Entrapment Still Happens

- Between 2009 & 2013, Consumer Protection reported 33 victims of “circulation entrapments”
  - 73% were younger than 16 years old
  - 45% associated with pools; 33% with spas
  - 64% were in public pools/spas; 30% in residential
  - 42% trapped in suction; 33% missing covers

- Injuries only - no fatalities

1. VGB compliant drain covers

- All drain covers made after December 2008 must meet ASME/ANSI A112.19.8, or successor standard, ANSI/APSP-16 2011
- CPSC requests manufacturers include “VGB 2008” on covers
- ASME requires info on covers:
  - Use for either single or multiple drains
  - Flow rate GPM
  - “Life” (number of years)
  - Wall and/or floor mount
  - Manufacturer’s name
  - Model number
VGB Act Requirements – Part 1

- Drain cover manufacturers should provide a certification document with each drain cover stating that it complies with VGB Act.
- If no mark or you’re in doubt, contact manufacturer and ask for a copy of VGB compliance certificate.
- Keep records where and when your drain covers were purchased.
2. **Secondary safety measures**

- Pools/spas with single main drain (smaller than 18" x 23" and not an “unblockable drain”), or with 2 main drains less than 3’ apart must either:
  
1. Disable drain(s) **or**

2. Install second anti-entrainment device:
   
   - Automatic pump shut-off system
   - Gravity drainage system
   - Safety Vacuum Release System (SVRS), or
   - Suction-limiting vent
VGB Act Requirements – Part 2

- Pool/spa with unblockable drain or 2 main drains more than 3’ apart are **not** required to disable drain or install secondary shut-off device.

- Unblockable drain = “drain of any size and shape that a human body cannot sufficiently block to create a suction entrapment hazard.”
VGB Act - **Free** Online Course

https://www.nspf.org/virginia-graeme-baker-pool-spa-safety-act-online-course

- Identify the components of the Pool & Spa Safety Act
- Identify the use of multiple safety steps
- Identify how to calculate total dynamic head and its importance for determining the pool system flow rate
- Identify Pool & Spa Safety Act compliance and inspection requirements
- Identify how to plan and conduct an inspection to ensure compliance with the Pool & Spa Safety Act
- Identify how to formulate recommendations for corrective action recommendations to bring a facility into Pool & Spa Safety Act compliance
Common Problems

“The car is clean but now the pool is dirty.”
Leaking Pools

https://www.youtube.com/watch?v=lUdc94agRKw
Super Chlorination

○ Scenario
  ○ Free chlorine less than 1 ppm
  ○ Strong chlorine odor present
  ○ Bottom of the pool not visible

○ Problems
  ○ Pool not regularly being super chlorinated
  ○ Sand media old and not filtering properly

○ Super chlorination
  ○ Oxidizes contaminants, causing them to evaporate
  ○ Recommended this be done weekly
Common Problems

- Murky or dirty pool water
  - Inadequate filtration/disinfection
  - Algae growth
  - Frogs/animals in pool
  - Insufficient turnover
  - Poor water chemistry

- Equipment corrosion
  - Bright green pool – high levels of copper
  - Red/brown – high levels of iron
  - Improper pH

- Scum lines – prevented by regular cleaning
Training

o NSPF (National Swimming Pool Foundation)
  https://www.nspf.org/cpo-certification
  o Pool and Spa Basics
  o Water Chemistry Basics
  o Virginia Graeme Baker Pool & Spa Safety Act
  o Field Service Professional: Routine Maintenance for Pool and Spa Operators
Contact Information

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