Pool Disinfection and Breakpoint Chlorination

Fecal Accident
Unsatisfactory Water
Combined Chlorine
Vomit, Blood and Animal Response
Disinfection means to remove bacteria, parasites and viruses from the water by sanitizing the pool water. Disinfection is used in the following situations:

- Fecal Accidents
- Unsatisfactory Water samples
- Vomit or Blood in the pool water or on pool surfaces

Breakpoint chlorination is used to reduce or eliminate combined chlorine. Breakpoint chlorination is adding chlorine to the pool water in quantities large enough to remove the combined chlorine.

The guide provides only minimum requirements. Please contact Public Health-Madison and Dane County or your pool professional and/or chemical suppliers for additional information.

Information included is based on CDC and State of Wisconsin Department of Health-Food Safety and Recreational Licensing guidance.
Fecal accidents contaminate pool water which can lead to illnesses. These illnesses are spread when swimmers swallow the contaminated water.

*Disinfection is required when there is a fecal accident in the pool water.*

**Disinfection Steps**

1. Close the pool.
2. Remove the feces with a net and disinfect the net. Do not use vacuum.
3. Test cyanuric acid levels if using stabilizer, pucks/pellets like trichlor or dichlor. Cyanuric acid level must be below 30 ppm.
4. Turn off disinfectant feeder.
5. Use non-stabilized chlorine to disinfect.

Diarrhea Procedures
- Clean and brush pool walls, skimmers and skimmer baskets.
- Increase chlorine level to:
  - 10 ppm for 25 ½ hours
  - 20 ppm for 13 hours

Formed Stool Procedures
- Increase chlorine level in the area where the feces was found to:
  - 3.0 ppm for 20 minutes
  - 4.0 ppm for 12 minutes
- At the end of the day, breakpoint chlorination should be done—see page 5

6. Adjust pH to 7.2—7.5.
7. Check proper operation of filtration equipment.
8. Backwash the filters.
9. For whirlpools, drain and refill at this time.
10. Turn on chemical feeders and balance chemicals in this order:
    - Total alkalinity
    - Chlorine/Bromine
    - pH
11. Reopen the pool.
12. Complete *Fecal Incident Response Form* and maintain a copy onsite.

*Review CDC Fecal Accident Response booklet for more information.*

See *Chemical Levels, Temperatures and Testing Frequency* for acceptable operational levels.
Unsatisfactory water tests occur when disinfectant levels are below minimum requirements and/or the pool filtration system is not working properly. The unsatisfactory test results listed below are indicators that the pool is not being properly maintained. See Understanding Monthly Pool Testing factsheet.

- Bacterial counts above 200 (HPC)
- Positive for coliform bacteria
- Positive for E. coli bacteria

### Disinfection Steps

2. Test cyanuric acid levels if using stabilizer, pucks/pellets like trichlor or dichlor. Cyanuric acid level must be below 30 ppm.
3. Turn off disinfectant feeder.
4. Clean and brush pool walls, skimmers and baskets. This helps remove biofilms that can seal and trap pathogens that can later be released and cause recontamination.
5. Use non-stabilized chlorine and increase chlorine to 2-10 ppm for pools and 3-10 ppm for whirlpools. For other pool types, see fact sheet referenced below.
6. Adjust pH to 7.2-7.5.
7. Check proper operation of filtration equipment.
8. Maintain chlorine and pH levels for at least 1 turnover. See blue box below.
   -Most pools turnover in 6 hours
   -Whirlpools turnover in 30 minutes
   -Wading pools turnover in 2 hours
9. Backwash the filters.
10. For whirlpools, drain and refill at this time.
11. Turn on chemical feeders and balance pool chemicals in this order.
   -Total alkalinity
   -Chlorine/Bromine
   -pH
12. Call (608) 243-0330 to notify sanitarian of reopening chemical levels and determine if ok to reopen without sanitarian recheck or resample.
13. Reopen the pool.

### Calculate Pool Turnover Rate

\[
\text{Gallons of pool water} \div \text{Flow Rate (use flow meter)} \div 60 \text{ minutes} = \text{turnover in hours.}
\]

See [Chemical Levels, Temperatures and Testing Frequency](#) for acceptable operational levels.
Combined chlorine is from sweat, saliva and urine mixing with the pool water. Combined chlorine can cause water cloudiness, “chlorine” odors as well as eye and skin irritations. Make sure to test and record combined chlorine twice a week for swimming pools and once a day for whirlpools. Keep combined chlorine levels below 0.8 ppm in indoor pools and 0.5 ppm in outdoor pools.

*Breakpoint chlorination is the only way to remove the combined chlorine from pool water.*

### Breakpoint Chlorination Steps

1. **Close Pool.**
2. **Test cyanuric acid levels if using stabilizer, pucks/pellets like trichlor or dichlor.** Cyanuric acid level must be below 30 ppm.
3. **Turn off disinfectant feeder.**
4. **Clean and brush pool walls, skimmers and baskets.** This helps remove biofilms that can seal and trap pathogens that can later be released and cause recontamination.
5. **Test combined chlorine and use only non-stabilized chlorine.** To determine the amount of chlorine to add, multiply combined chlorine by 10. For example, if combined chlorine is 2.0, then increase chlorine levels to 20 ppm.
6. **Adjust pH to 7.2-7.5.**
7. **Check proper operation of filtration equipment.**
8. **Maintain chlorine and pH levels for at least 2 turnovers.**
   - Most pools turnover in 6 hours
   - Whirlpools turnover in 30 minutes
   - Wading pools turnover in 2 hours
9. **Backwash the filters.**
10. **For whirlpools, drain and refill at this time.**
11. **Turn on chemical feeders and balance pool chemicals in this order.**
    - Total alkalinity
    - Chlorine/Bromine
    - pH
12. **Reopen the pool.**

### Calculate Pool Turnover Rate

\[
\text{Gallons of pool water} \div \text{Flow Rate (use flow meter)} \div 60 \text{ minutes} = \text{turnover in hours.}
\]

*If using a non-chlorine shock product to reduce combined chlorine levels, make sure you have the proper testing chemicals to eliminate the interference from the shock chemicals.*

See [Chemical Levels, Temperatures and Testing Frequency](#) for acceptable operational levels.
Vomit, Blood and Animal Response

Vomit in Pool Water
Vomiting can occur when swimmers swallow pool water. If a swimmer vomits water, no special disinfection is required. If the swimmer vomits their stomach contents then follow the directions on page 3 of the formed stool fecal accident procedure to properly disinfect the pool water.

Blood in Pool Water
Blood in properly chlorinated pool water is not a safety risk to swimmers because the chlorine will kill germs on contact. Closing the pool is not necessary. Due to public perception, some pools managers may temporarily close the pool to satisfy customer concerns.

Blood, Feces or Vomit on Pool Surfaces
Body fluids, including blood, feces, and vomit are all considered potentially contaminated with germs. Therefore, spills of these fluids on the pool deck should be cleaned up and the contaminated surfaces disinfected immediately. Follow the CDC recommendations for Cleaning Up Body Fluid Spills on Pool Surfaces.

Blood Spill Kit:
- Disposable gloves
- Chlorine Disinfectant
- Biohazard disposable bags
- Absorbant material to contain spill

See First Aid and Blood-Biohazard Kit Contents for additional items required.

Animals
Birds, raccoons and dead animals in the pool water can be problematic. Click here for more information from the CDC.

See Chemical Levels, Temperatures and Testing Frequency for acceptable operational levels.