

## **SWIMMING POOLS/SPAS**

### **Facts**

Administrative Rules of Montana Requirements:

#### **Ideal pH 7.2–7.6**

- An increase or decrease of 1 on the pH scale represents a 10-fold increase or decrease in acidity or basicity
- At pH 7.2, 66% of the added chlorine is available as HOCl
- To control pH, soda ash (sodium carbonate) or caustic soda (sodium hydroxide) can be added to pool water
- To lower pH, sodium bisulfate or muriatic acid can be used

Alkalinity 80–220 ppm

- Most effective way of raising total alkalinity without great effect on pH is to add sodium bicarbonate (baking soda)

Calcium is one of the most important minerals for pool operators to monitor

- Calcium is usually 70% of the total hardness reading
- Addition of 1 lb anhydrous trisodium phosphate per 10,000 gal of water will lower calcium hardness by 11 ppm
- Level of hardness can be raised through addition of calcium chloride
  - o Must add calcium chloride to pool, NOT water to calcium chloride

#### **Slope 1:3 (one foot vertical to three feet horizontal)**

#### **Depth markers ≤ 25-foot intervals**

Minimum depth 3 feet (not to exceed 3 feet, 6 inches)

#### **Coliform test *at least twice per year***

- One sample taken between 4/1 and 6/30
- Second sample taken between 8/1 and 10/31

Sloped entries should not exceed 1:12 slope

Steps/ladders required in vertical distance from bottom of pool to deck/walk > 2 ft

Ladder should have 7-in minimum width uniform distance between treads

Must use centrifugal pump for circulation

1 drinking fountain per 1000 bathers

#### **Nitrate test of system at least once every three years**

## Circulation

- At least 70% return water from skimmers/gutters and remainder from main deck
- **Must operate 24 hours a day**

Surface skimmers (overflow gutters/skimers) shall be provided for each pool, spa, etc.

## NTU should not exceed 0.5 and max of 1.0 NTU at peak use load

- If NTU reaches 1, it must return to 0.5 within 8 hours of the peak use

Langelier Saturation Index = Effective way of fighting corrosion and scale damage to pool and equipment.

## Diseases and Pathogens Associated:

- Pseudomonas
- Cryptosporidium
- E. coli
- Legionella pneumophila
- Streptococcus
- Staphylococcus
- Polio
- Giardiasis
- Leptospirosis
- Schistosomiasis
- Impetigo
- Ringworm
- Other fungus infections

To provide maximum protection, free chlorine in **pools** should be:

- Minimum of 1.0 ppm
- Ideal 2.0–4.0 ppm
- Maximum 5.0 ppm

To provide maximum protection, free chlorine in **spas** should be:

- Minimum of 2.0 ppm
- Ideal 3.0–5.0 ppm
- Maximum 10.0 ppm

## Chlorine:

- Disinfectant is most effective when free chlorine level of between 1.0 and 1.5 ppm is maintained
- Strong sunlight causes decomposition of HOCl in pool.
- The total concentration of residual “free chlorine” plus the residual “combined chlorine”
- Combine chlorine is the combination of chlorine and ammonia

- Free chlorine, when combined with cyanuric acid, is called “stabilized” chlorine.
- Superchlorination usually results in exceeding the breakpoint. Depending on pH, a free chlorine concentration of 0.4 to 1.0 ppm should be maintained at all times.
- Chlorine gas is 100% available chlorine.
- The largest area of contamination is at the water’s surface.
- Spray pools are considered the preferable public health option.
- Fill-and-draw pools are not acceptable for use due to rapid contamination.

#### Turnover Rates:

- Pool = 6 hours
- Wading pools, interactive play attractions, spray pools, splash decks = 1 hour
- Spa = 30 minutes

#### Pool Filter:

- A good filter should remove all particles larger than 10 micrometers
- Purpose is to clarify and polish water, NOT to remove bacteria or viruses
- Rapid rate sand filter
  - o Operates at max filter rate of 3 gal/min per square foot
- High rate sand filter
  - o Operates at max filter rate of 12–20 gal/min per square foot
  - o Primary advantage is the much smaller size due to increased flow rates
- Diatomaceous earth (DE) filter
  - o Media comprised of microscopic marine plants spread in thin coat over filter bags or septa
  - o Requires same gauges, valves and cleanout capability as sand filters
  - o On vacuum DE, cutoff switch should be installed in case vacuum rises above acceptable levels
  - o Provides water clarity of excellent quality
  - o Requires more attention than sand filter (continuous feeding and disposal)
- Cartridge filter
  - o Primarily recommended for indoor pools or facilities < 80,000 gal
  - o Require that extra filter cartridges be on hand at all times
- Gravity sand filter
  - o Seldom used today
  - o Significant cost to operate properly
  - o Operator adds alum as floe on top of filter to increase particle removal efficiency

#### Spas

- Require 10 square feet per person minimum
- Water hardness should be kept between 100 and 400 ppm
- Cartridge filter is most popular & should provide turnover of 30 minutes
- Pregnant women may use 104 degree hot tub for a max of 15 minutes