POOL EQUIPMENT, OPERATION, AND MAINTENANCE

Pool Equipment

- Outlets/ Return Inlets
- Pumps and Filters
- Chemical Feeders
- What are they? How do they work? How are they maintained?

Outlets and Return Inlets

Outlets

The design is for water to go out of the pool.

Two types of outlets:

- Overflow outlets
- Main drains

Return Inlets

The design is for water to come back to the pool from the equipment room.

Overflow outlets:

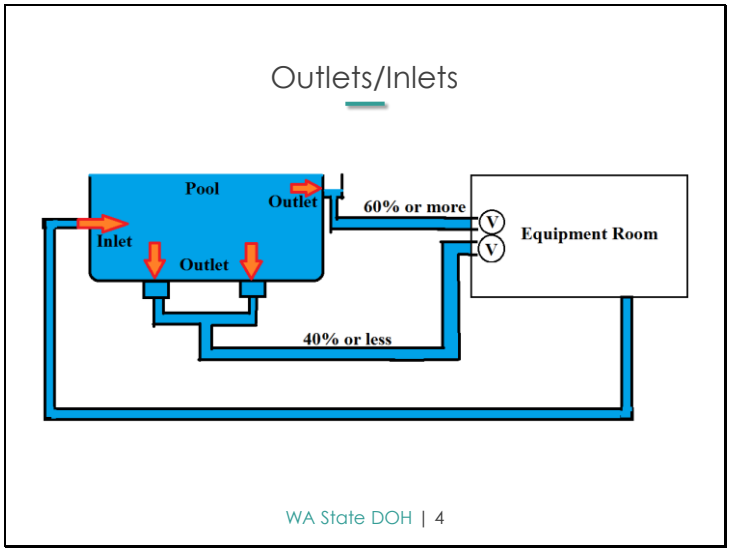
- Skimmers or gutter system
- Debris and grease floating on top get skimmed
- Surface water movement impacts overall mixing

Main drains:

- Main drains at the deepest part of the pool
- Debris heavier than water get sucked out

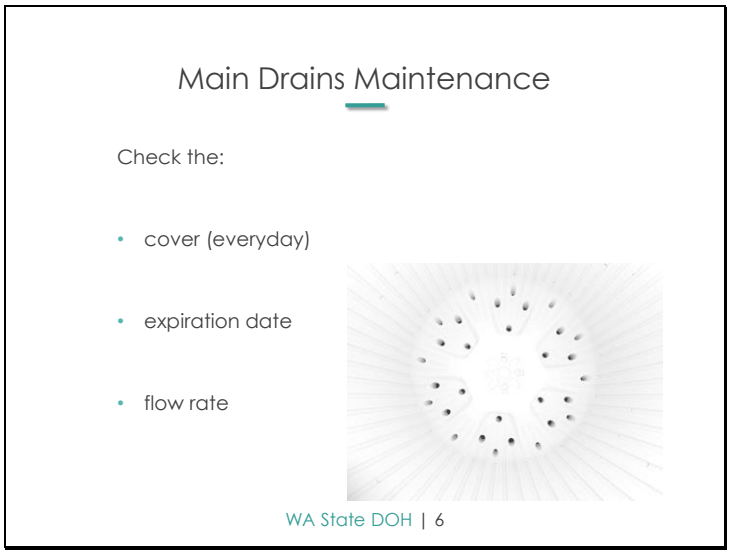
Inlets:

- Are often on pool walls
- Large pools (>2,500 square feet) must have floor inlets
- Inlets are placed strategically to promote mixing of water



Virginia Graeme Baker Pool and Spa Safety Act (VGB 2008):

- Dual Main Drains (3 feet or more apart)
- VGB compliant covers
- VGB compliant flow speed through the cover
- VGB compliant sump design



Check the cover every day:

- For cracking
- For breaking
- For coming loose
- For turning

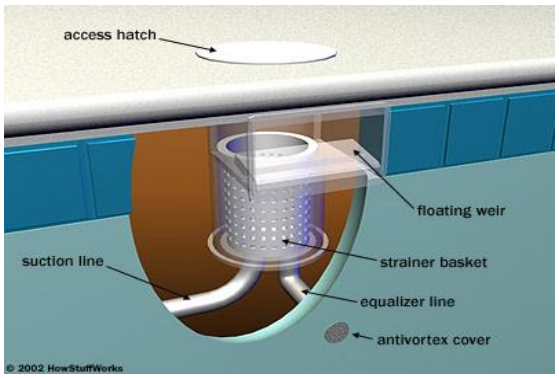
Check the expiration date:

- Most covers are good for 5 years (from the date of installation)
- Keep the owner's manual

Check the flow rate:

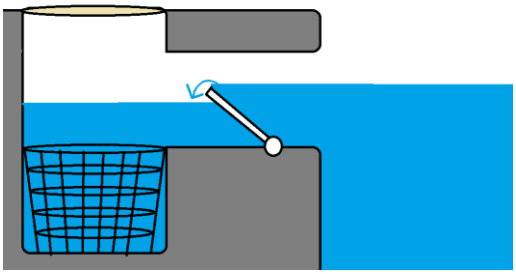
- Flow rate greater than normal is suction hazard

Skimmers



Skimmers

- Weir is important for effective skimming
- Water level must be maintained



Skimmer Maintenance

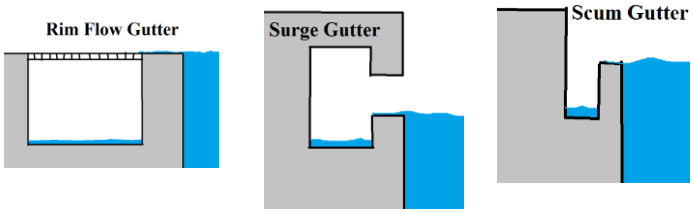
- Check the water level, weir, basket, and hatch
- Check the equalizer line cover
- Replace these parts as necessary.

Gutters

- A gutter is an overflow outlet superior to skimmers by design
- It surrounds the entire pool

Gutters

Types of gutters:



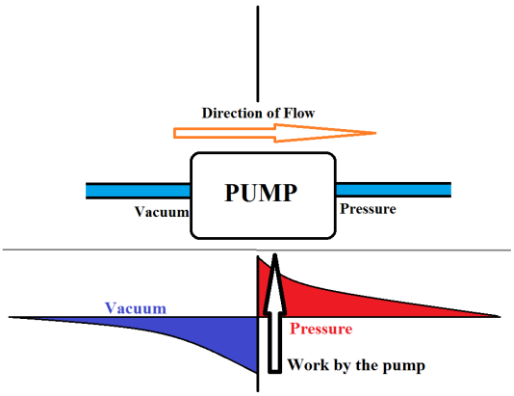
Gutter Maintenance

- Check if the entire gutter is level
- Follow the maximum bather load (can overwhelm the gutter)
- Clean regularly to remove oils and debris
- Check the gutter grate (missing, cracking, broken)
- Check water level controller in the surge tank

Return Inlets

- Design and Function:
  - Pipe openings on pool walls and floors where water comes back into the pool
  - Often eyeball fitting attached to wall inlets
  - The locations, numbers, and types are part of the design
- Maintenance:
  - Check for missing or broken inlet fittings
  - **Never change the direction of eyeball fittings (It alters the mixing pattern)**

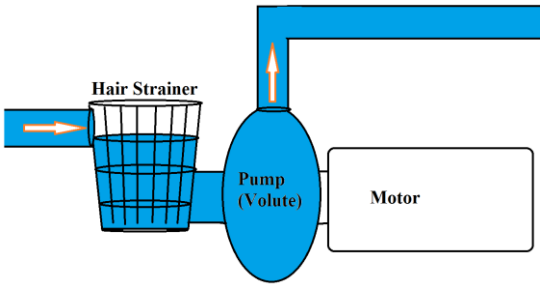
Pumps



- Creates vacuum on one side (suction side) and pressure on the other (discharge side)
- Vacuum pulls* water from the pool
  - *Technically, this is not correct. What is really happening is that vacuum creates a void on one side of the pump. Atmospheric pressure and pressure head (depth) push the water to fill the void.
- Pressure pushes water back to the pool

Pumps

A typical pump:



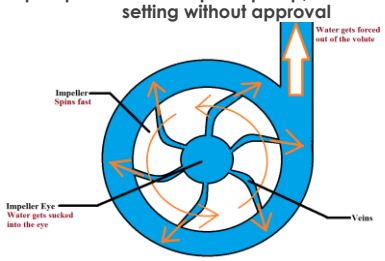
Pumps

Inside the Volute:

- Centrifugal force created by the spinning impeller pushes the water out of the volute

Do not replace the pump with a different model without approval

If your pump is a variable speed pump, DO NOT change the setting without approval



Design:

- Horse Power of the Pump determined by:
  - The diameter of the impeller
  - The # of revolutions per minute
- Horse Power of the pump together with the hydraulic characteristics of your pool determines the flow rate

Maintenance:

- Check for leaks, worn seals, cracks, clogs, positioning of valves, and water level.
- Check for clogged, worn, or broken impeller and impeller rotation.
- Fill the pump (and suction pipe if not self-priming) with water for priming

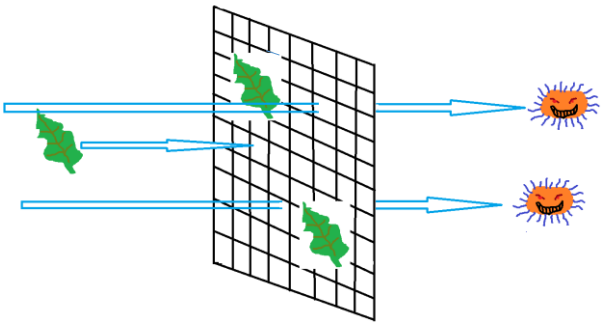
Cavitation

Watch out for cavitation

- Cavitation is destructive to the equipment
- The pump makes unusual sound (Sounds like rocks flowing through the pipe)
- The pump and pipe vibrate
- Caused by starvation of water on the suction side of the pump

- Situations that cause cavitation are:
  - Clogged skimmer basket
  - Clogged hair strainer
  - Dirty vacuum filter
  - Clogged suction pipe
  - Etc.

Filters



Filters

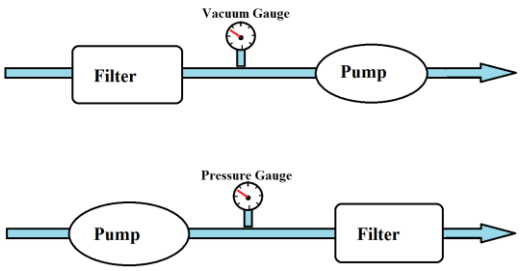
There are three different types of filters:

Filter Type	Particle size removed	Filter media rate
Sand	25 microns	Up to 20 gpm/ft^2
Cartridge	15 microns	Up to 0.375 gpm/ft^2
DE	4 microns	Up to 2 gpm/ft^2

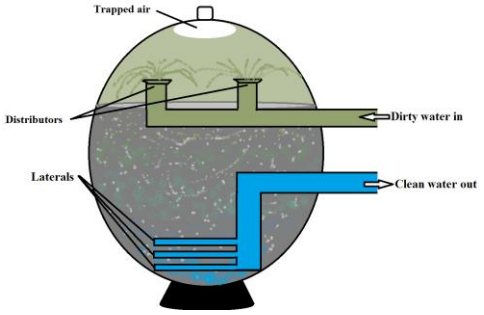
- Filters can catch large debris, but not germs
  - Bacteria (about 1 micron)
  - Cryptosporidium (4 to 6 microns)
  - Viruses (less than 1 micron)

Filter Location

- Vacuum Filter: Suction side of the pump
- Pressure Filter: Discharge side of the pump

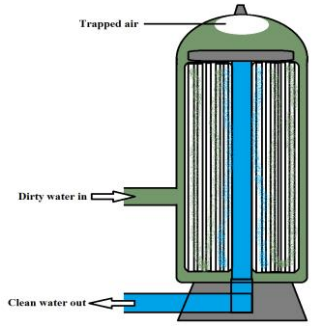


Sand Filters



- High-Rate Sand Filter:
  - Most common sand filters today
  - Sizes vary from 2 to >10 feet in diameter
  - Uses #20 standard silica sand
  - Sand filters need to be backwashed (8 to 10 psi above normal)
  - A minimum of 15 gpm/ft^2 needed
  - Replace sand every 5 to 15 years

Cartridge Filters



- Uses synthetic fabric as filter media
- Pleated to increase surface area
- Filter element is cleaned (not backwashed)

Maintenance:

- Clean when:
  - Pressure reading goes up by 10 psi from the start-up

- Clean by
  - (Normally)
    Removing the filter element and hosing off
  - (After mineral build-up or unintended high flow)
    Soak the element in commercial filter cleaning product
    Rinse thoroughly
    Replace the element back into the casing and check the O-ring

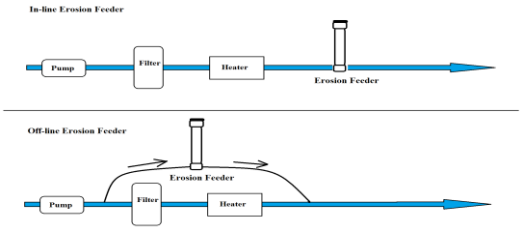
Chemical Feeders

- For disinfectants
  - Solid
  - Liquid
  - Gas
- For pH adjustment chemicals
  - Liquid
  - Gas
- For supplemental disinfectant
  - Ozone

Erosion Feeders

Off-line Erosion feeders for Trichlor tablets are very common

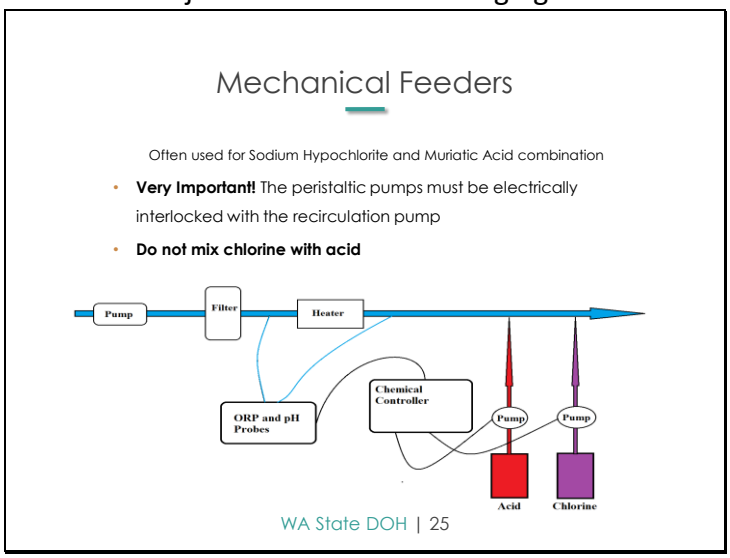
- **Do not put any disinfectant products in the feeder other than recommended by the manufacturer**
- **Do not remove the feeder or replace it with another model without consulting the health department**



Erosion Feeders:

- Use the control valve or the knob to adjust the amount of water entering the feeder
- Erosion feeders are pressurized.
- Do not open the lid unless the pump is off and the pressure is down
- Trichlor makes water acidic
- Chlorinated water is introduced after the heater

- Using Trichlor means adding cyanuric acid whenever adding chlorine
- Adjustment can be challenging



Mechanical feeders:

- Sample water for probing must be taken from:
  - downstream from the filter
  - upstream from the heater
  - Upstream from the chemical feeder
- Clean probes following manufacturer's instructions
- Adjust the pool water chemistry manually first and set the controller
- Clean the feed lines when they get clogged with debris
- Change the chemical feed lines as they wear and tear
- Chemical controller automatically operates the peristaltic pumps to inject acid and chlorine into the main recirculation line
- Chemical controller uses the ORP reading (not the actual chlorine level) to adjust chlorine injection
- Peristaltic pumps could fail and leak
- Do not put chemicals under the peristaltic pumps