INTRODUCTION TO BASIC POOL ENGINEERING
APRIL 2018

WHAT WE WILL LEARN:

- Importance of knowing the volume of your pool
- Pool components and how they are related to one another
- Importance of recirculation

WE WILL ALSO LEARN ABOUT:

- Reading flow meters
- Calculating turnover rates
- Dangers of working with pressurized equipment

IMPORTANCE OF KNOWING YOUR POOLS VOLUME:

- Essential calculation to maintain proper management of your aquatic feature (i.e. pumps, filter size, flow rate)
- Needed to calculate flow rate and turnover rate
- Chemical dosage is determined by the pool's volume.

CALCULATING TURNOVER RATE

Turnover Rate (TOR/hr) = Pool Volume / Flow Rate / 60 (min/hour)

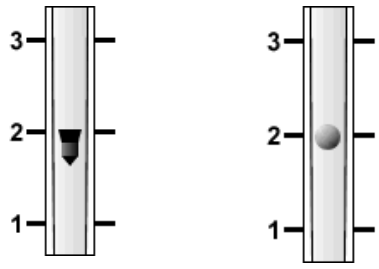
Example: You have a 100,000 gallon swimming pool with a flow rate of 360 gpm. TOR equals 277 minutes or 4.6 hours

Pool Type	WAC Requirements
Swimming Pools	6 hours or less
Wading Pools	3 hours or less
Spas	30 minutes or less

HOW TO CALCULATE YOUR POOL'S FLOW RATE:

- Flow rate (gpm) = Pool Volume / Turnover Rate / 60 min/hour
- Is critical in meeting all operational requirements
- The design flow rate shall be sufficient to achieve the required turnover rate.

HOW TO READ A FLOW METER:



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HOW TO CLEAN A FLOW METER:

1. Turn off the circulation pump.
2. Use a soft bottle brush and mild soap solution.
3. Routinely clean inside of the meter.

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Install on the return piping after all other system components, except the chemical feed injection.

CHEMICAL DOSING

- First, chemically test the pool water and evaluate the results.
- Pool operators should always follow the manufacturer's instructions on the product.
- The quantity of water normally determines how much chemical(s) should be added to the body of water.

IMPORTANCE OF RECIRCULATION

- Allows you to filter your water and remove large and small particles
- Helps spread chemicals throughout the pool for proper water quality
- Proper recirculation can help kill and prevent the spread of Recreational Water Illnesses

PRESSURE GAUGE

- Generally found on top of filters
- Measure in pounds per square inch (psi)
- Rule of thumb: clean or replace filter media if 10 psi or higher of the normal operating psi

Clean or replace per manufacturers recommendations.

VACUUM GAUGE

- Located just before the pump
- Measured in inches of Mercury (Hg) or kPa
- Measures how hard the pump is working

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Pool operators should know the base and clean/normal gauge reading for their system.

EXAMPLES OF MAIN DRAIN COVERS

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GUTTERS

- Perimeter recirculation system
- Used on swimming pools 2,500 square feet or more in Washington
- Surface water is displaced into the gutter then travels from the pool to the filter

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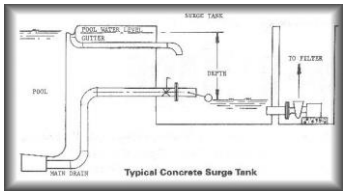
SURGE TANKS

- Also known as collection tank or balancing tank
- Water is displaced when bathers enter the pool
- The displaced water is collected and held either in a surge tank, gutter, or skimmer system



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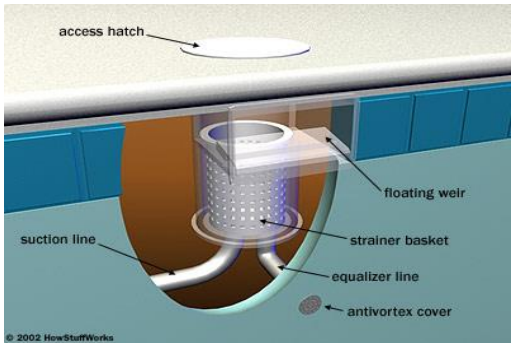
SURFACE SKIMMERS



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PUMP: THE MAIN FEATURE OF CIRCULATION

1. Pulls water from the pool through
   - skimmers or gutters and main drains
2. Pushes water through
   - filter(s)
3. Returns water to the
   - return inlets

COMPONENTS OF A PUMP

1. Hair and lint strainer
2. Impeller
3. Motor

POOL WATER FILTRATION

Sand filtration
- Oldest type
  - Replace the sand every 5 to 15 years.

Cartridge filtration
- Newest form
  - Clean filters per manufacturer's recommendation.

Diatomaceous earth (D.E.)
- Most efficient type
  - removes the smallest particle size of any pool/spa filtration device

DIFFERENT TYPES OF FILTERS

Sand

Cartridge

D.E.

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FILTER MEDIA

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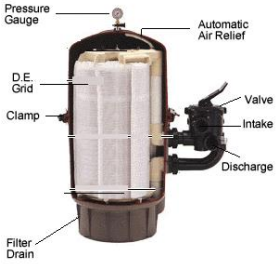
Interior components: air release, overflow distributers, sand (read manufacturers recommendation), backwash flow (up), and manifold-lateral underdrains (reason for sand in pool).



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HEATERS

- Water temperatures should not exceed 104° F
- Temperature controls should be protected against unauthorized users
- Install before chemical injection

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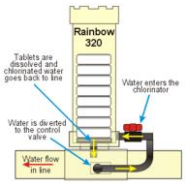
DISINFECTANT FEEDERS

- Eliminates nearly all pathogens in pools and spas
- To prevent over-feed and unsanitary waters the feeder needs to be sized properly



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Feeders and control components shall meet NSF/ANSI 50 Standard

DISINFECTANT FEEDERS

- Always read the chemical label instructions, no matter if you are manually adding chemicals to the pool or using mechanical feeders.

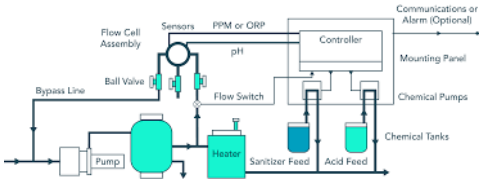

*Image presented by sensorex

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RETURN INLETS

- Flow patterns provide equal distribution of chemicals and temperature throughout the pool

- Location
  - Wall
  - Floors
  - Combination of both

- Essential in eliminating dead or stagnate areas

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RETURN INLET DESIGNS

Replace if
- Missing
- Sharp edges or extensions develop

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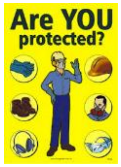
Note: Replace to original specifications; typical eyeball shape.

PRESSURIZED EQUIPMENT DANGERS

- All equipment after the pump operates under pressure
- Shut the pump off, monitor the pressure gauges, and bleed the air from the system, before adjusting any equipment
- Use Personal Protective Equipment when dealing with components



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Note: equipment to watch closely: pump, pressure filters (sand, cartridge), and erosion feeders.

REFERENCES

1. National Swimming Pool Foundation (2014). *Pool and spa operator handbook*. Colorado Springs, CO.

2. DeLong, D., Ellis, R., Fraser, G., Greenman, S., Trusty, M., & Weiss, P. (1997). *Pool operator's manual: A guide for safe and healthy operation of swimming and spa pools*. Washington State Public Health Association and the Washington State Environmental Health Association.

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