INTRODUCTION TO BASIC POOL ENGINEERING
MARCH AND APRIL 2020

DOH Water Recreation Program

Presenter: Justin Law

WHAT WE WILL LEARN:

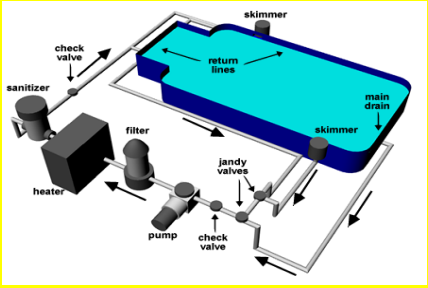
- Importance of knowing the volume of your pool
- Pool components and how they are related to one another
- Importance of recirculation

WE WILL ALSO LEARN ABOUT:

- Flow meters
- Calculating turnover rates
- Dangers of working with pressurized equipment

3

POOL COMPONENTS



4

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

5

CALCULATING TURNOVER RATE

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

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

6

EXAMPLES OF CALCULATING TOR

Example 1: You have a pool volume of 175,000 gallons with a flow rate of 495 gpm. What is the TOR? Does the TOR meet Washington Administrative Code (WAC) requirement for a swimming pool?

Example 2: You have a pool volume of 45,000 gallons with a flow rate of 180 gpm. What is the TOR? Does the TOR meet WAC requirement for a wading pool?

7

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.

8

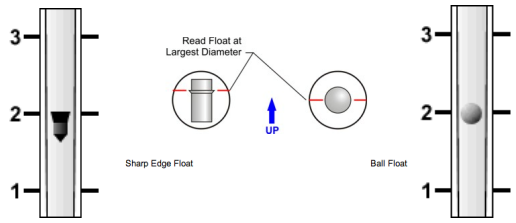
EXAMPLES OF CALCULATING FLOW RATE

Example 1: You have a pool volume of 300,000 gallons with a TOR of 6 hours. What is the flow rate?

Example 2: You have a pool volume of 950 gallons with a TOR of 30 minutes. What is the flow rate?

9

HOW TO READ A FLOW METER:



10

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

11

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

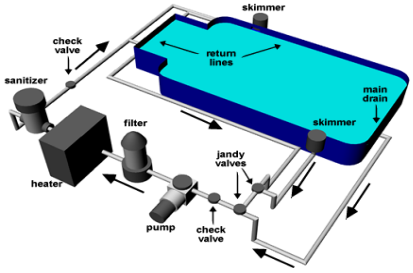
12

VACUUM GAUGE

- Located just before the pump
- Measured in inches of Mercury (inHg) or kPa
- Help measures a portion of the total work the pump is doing

13

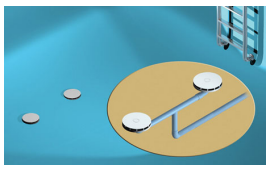
POOL COMPONENTS



14

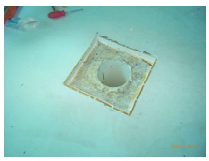
MAIN DRAINS

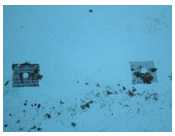
- Submerged suction outlet for transferring water from pools
- Virginia Graeme Baker Pool and Spa Act
- Contact your local health jurisdiction prior to making any changes



15

EXAMPLES OF MAIN DRAIN COVERS

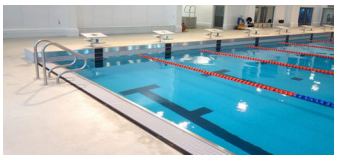


16

GUTTERS

- Perimeter recirculation system
- Required for 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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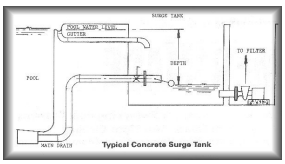
17

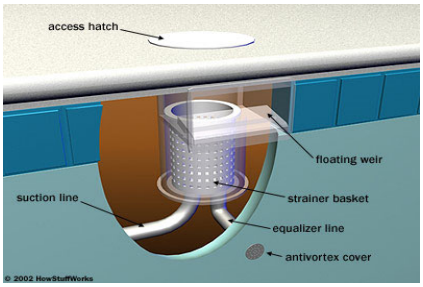
SURGE TANKS

- Also known as collection tank or balancing tank
- Water is displaced when bathers enter the pool
- Usually installed between the main drain system and recirculation pump



18

SURFACE SKIMMERS



19

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)
   - Heater (not required)
   - Disinfectant equipment
3. Returns water to the
   - return inlets

20

COMPONENTS OF A PUMP

1. Pump housing
2. Hair and lint strainer
3. Impeller
4. Motor (including shaft)
5. Mechanical shaft seals

*Do not replace your pump or pump motor without checking with your local health department

21

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

22

DIFFERENT TYPES OF FILTERS

Sand

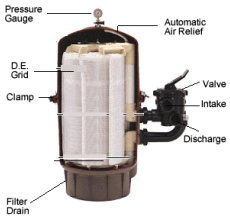
Cartridge

D.E.

23

INSIDE OF A SAND FILTER

24



25

HEATERS

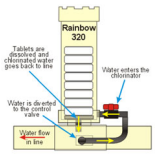
- Water temperatures should not exceed 104° F
- Temperature controls should be protected against unauthorized users
- Install before chemical injection
- Not a required piece of pool equipment

- Contact your local health department before making any changes to your recirculation system.

26

DISINFECTANT FEEDERS

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



27

DISINFECTANT FEEDERS

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

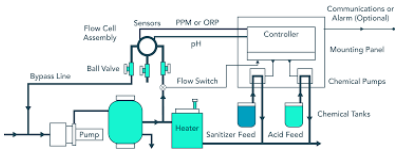


*Image presented by sensorex

28

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 stagnant areas

29

RETURN INLET DESIGNS

Replace if
- Missing
- Sharp edges or extensions develop

30

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.

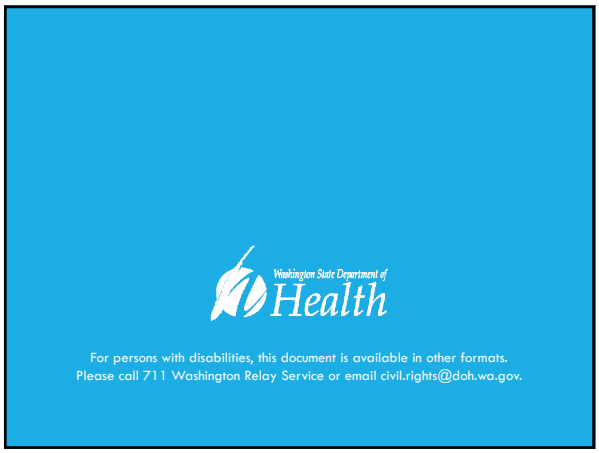
31

Questions?

QUESTIONS

1. What are two ways water is removed from a pool?
2. Explain the flow of water through a pool recirculation system.
3. What is the essential equipment for all pools and spas?
4. What is the purpose of installing and maintaining the flow meter on my recirculation system?
5. As a pool operator, what should you do before cleaning your recirculation pump strainer?

33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