

YMCA of the USA

YMCA Pool Operator's Manual (3rd Edition)

Study Guide

The Pool Operator

1. A Pool Operator can help keep pools and facilities safe, list six actions to keep pools safe:

_____	_____
_____	_____
_____	_____

2. Identify four diseases that can be transmitted through swimming pool water:

_____	_____
_____	_____

3. Cost-effective operations fall into three major categories:

4. List YMCA of the USA's four core values:

_____	_____
_____	_____

Anatomy of a Pool and Circulation System

1. List the typical sequence of water flow from the pool through the circulation system back to the pool:

- | | |
|----------|----------|
| 1. _____ | 5. _____ |
| 2. _____ | 6. _____ |
| 3. _____ | 7. _____ |
| 4. _____ | 8. _____ |

2. Name two surface collection systems:

3. Identify four types of valves:

Filtration

1. There are three basic types of filtration systems including:

2. The three types of temporary media of filters are:

Pressure Sand and Gravel Filters

3. The filter bed in each conventional sand filter tank is composed of 3 layers of _____ with a layer of _____ sand and a top layer of _____ sand.
4. Above the top layer of sand is an area called _____, which serves as an _____ area for the sand layer during backwash.
5. Dirt and solid impurities are retained, for the most part on _____, trapped between the _____.

High Rate Sand Filters

6. A high flow sand filter forces water through the filter bed _____ times faster than conventional sand filters.
7. The faster flow rate, along with a smaller filter tank permits the entire _____ to be used.
8. The smaller tank reduces backwash _____ and wasted _____.
9. A high flow sand filter uses one grade of dust free _____ grade sand up to _____ inches in depth.

Diatomaceous Earth Filtration

10. Diatomaceous earth is the _____, _____, _____, of microscopic marine _____.
11. The entire space of each diatom is about _____ fossil and _____ empty

space.

12. The configuration permits it to filter out material as small as _____ which is the size of some types of _____.
13. Dirt is trapped on the _____ of the D. E. coat which will cause the D.E. to _____ rapidly.
14. A method of extending D. E. Filter runs is : _____, _____ and _____
15. The manual procedure for interrupt D.E. filtration requires stopping the filter _____ times a day, causing the D. E. to fall off then recycling the old _____ and _____ back onto the filter elements.
16. The automated version of interrupt filtration is known as _____
_____ D. E.

Cartridge Filters

17. There are two different types of cartridge filters _____ and _____.
18. Surface cartridge filters use _____ paper or synthetics to filter water.
19. Cartridge filters are cleaned by _____ them in a chemical followed by a _____ rinse.
20. Cartridge systems may have significant value in _____ and _____ filtration.

Basic Swimming Pool Chemistry

pH

1. All substances with a pH between 0 and 6.9 are _____/
2. Any pH test result between 7.1 and 14 would identify the water as being _____.
3. Most state bathing codes require that pool water pH be maintained between _____ and _____.
4. If the pH drops below 7.2, it can cause metal surfaces to _____.
5. As pH readings approach 8.0 _____ and _____ can precipitate causing _____ or unclear water, _____ on filters, in the plumbing and in the _____.
6. At a pH of 7.2, approximately _____% (see Table 4.3 on page 45) of the chlorine will convert to hypochlorous acid.
7. At a pH of 8.2, approximately _____% (see Table 4.3 on page 45) chlorine will convert to hypochlorous acid.
8. A high pH can be lowered by the addition of _____ to the pool water. Acids used for this purpose include _____ and _____ acid.
9. Lowering pH can be accomplished with _____ gas, an alternative to liquid and _____ acids.
10. _____ is a popular alternative to liquid or dry acids for controlling pH.

11. Raising the pool pH involves adding _____ (_____
_____).

Total Alkalinity

12. Swimming pool water should contain between _____ and _____
of total alkalinity.

Calcium Hardness

13. The amount of hardness in a pool is also due to _____. If
hardness levels reach _____ to _____ ppm the pool should be
drained.
14. A minimum of _____ of hardness is recommended.
15. Hardness levels can be increased by adding _____.

Total Dissolved Solids

16. TDS levels are high _____ - _____ the water can be
_____, may taste _____, and spas will
_____ occur.

Langelier Saturation Index

17. The Langelier Saturation Index includes five (5) pool water variables: _____,
_____, _____, _____ and
_____.
18. The value -12.1 represents an assumed TDS level of up to _____.

19. Pool water testing provided the following results: pH = 7.3, Temperature = 82°, Calcium Hardness = 100 ppm, Total Alkalinity = 75 ppm. The LSI is _____.
20. Pool water testing provided the following results: pH = 7.3, Temperature = 86°, Calcium Hardness = 300 ppm, Total Alkalinity = 120 ppm. The LSI is _____.

Disinfection Systems

Chlorine Gas

1. Good safety practices for facilities using chlorine gas include a certified P.O.O.L. operator, at least one unit of _____ (SCBA) and a ventilated room with a vent fan that runs _____ hours a day.
2. A fire or explosion will occur if calcium hypochlorite comes in contact with _____ or human sweat (which contains ammonia).
3. Chlorine gas is an acid and attention must be given to pH of the pool by continuous addition of _____ (_____).

Calcium Hypochlorite

4. Calcium hypochlorite is available in _____ and _____ forms, all of which raise the pH level.
5. Reducing pH levels elevated by calcium hypochlorite can be accomplished using _____ acid, _____ or _____.

Sodium Hypochlorite

6. Sodium hypochlorite in concentrations of _____ to _____% is required for swimming.
7. Sodium hypochlorite has a rapid deterioration results in a shelf life of _____ to _____ days from _____ of _____.

Chlorinated cyanurates

8. Chlorinated cyanurates, such a di-chlor and tri-chlor, are referred to as _____ chlorine.
9. When chlorinated cyanurates are used, chlorine is “locked up” in the pool reducing chlorine dissipation from sun, _____, _____, _____ and _____.
10. Cyanuric acid (stabilizer) is _____ to humans in levels above _____.

Bromine

11. Bromine reduces _____, can turn water _____, _____ pool walls and cause a _____ effect.
12. Bromine is _____ to _____ times more expensive than chlorine gas.

Chlorine Generation

13. The system generates chlorine through _____, running an electric current between _____ and _____ plates immersed in salt water.

Calculation for Chemical Dosage and Filtration

Chemical Dosage

1. Your pool has just been filled with water for the summer. It holds 150,000 gallons of water. How many pounds and ounces of Calcium Hypochlorite tablets (70% strength) will it take to give you a free residual of 2.0 ppm?

Pool Capacity Calculations

2. A circular wading pool is 30 feet in diameter. Depth at entry around the pool is 6 inches. Depth at the center is 18 inches. How many gallons of water does the wading pool contain? _____ gallons
3. The therapy pool is 60 feet in length, 30 feet in width. The shallow end depth is 3 feet and the deep end is 5 feet deep. What is the volume of the therapy pool? _____ gallons
4. A YMCA competitive pool is 50 meters long and 25 meters wide. Depth at the shallow end is 2 meters and 4 meters in the deep end. How many gallons of water will it take to fill the pool after draining and cleaning it? _____ gallons
5. The pool filtration system is being replaced with new D. E. filters. The pool is 75 feet long, 45 feet wide, 3 ½ feet deep at the shallow end and 12 feet in depth at the deep end. How many square feet of filter surface area will you need in the new DE system to provide a 6 hour turnover? _____ square feet.

Water Testing

General Tips

1. Purchase a comprehensive, _____ test kit manufactured by a recognized company.
2. Use chemicals made for _____ test kit. Chemicals from one _____ are _____ compatible with test _____ from another.
3. Almost all water testing chemicals are _____ after _____ year(s).
4. Phenol Red, used for testing _____, has a maximum shelf life of _____.

Testing Procedures and Testing for Chlorine

5. Avoid taking water samples from _____ in _____ of water _____ where chemical concentrations are _____.
6. The preferred light sources for reading test cells are from _____ to _____: _____ light and _____ light.

Common Water Problems

Turbid Water

1. Turbidity means _____.
2. If cloudy or turbid water condition exists, check immediately for _____ and _____ levels.

Algae and Their Control

3. Algae is a single-cell _____ that thrives in water of high _____ and in sunlight and _____.
4. If algae gains a foothold in your pool, superchlorinate to _____ overnight, then _____ pool walls and bottom with a _____ brush, then _____ the pool and adjust your water chemistry.

Hard Water

5. To alleviate hard water problems by softening, use a chemical called Calgon or _____.

Colored Water

6. Colored water is caused by the presence of _____ in solution.
7. Among the most common metals and the color they impart to water are copper (blue or _____), iron (_____ or _____) or possibly _____ and manganese (_____ or _____) color.

Spa and Other Warm Water Facilities

Spa Operation Standards

1. The single most important safety factor in Y spa operation is a _____.
2. Each Y should have _____ and rehearsed emergency and

_____ management procedures for its spa.

Physical Hazards

- 3. Drownings are frequently caused by alcohol, the body's _____ to hot water, hair _____ and _____ unconscious into the spa after striking the head.
- 4. The re-set button for the water jets should be placed at least ____ _____ from the tub so users must physically _____ the tub to turn the jets on again.

Health and Disease Hazards

- 5. Hot water, _____ _____ _____, low disinfectant levels and _____ _____ provide an excellent growth environment for harmful bacteria.
- 6. Two people in a 400 gallon capacity spa are the equivalent to _____ people immersed in a 210,000 gallon pool.

Hazard Identification and Risk control

- 1. In order to understand the magnitude of responsibility you have you should be familiar with the legal process:
 - 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
 - 5. _____

6. _____
2. In the law of negligence, the person bringing the suit – _____ -
must prove four elements:

3. Maintaining accurate _____ is one way to protect
yourself and your YMCA.
4. A _____ chart can help you plan actions to prevent future
accidents.

Aquatic Health and Safety Issues

1. When dealing with contaminated human waste, _____ or other body
fluids wear latex or rubber gloves
2. When responding to a fecal accident, follow
_____/_____ Episode Action Report found on page
_____ in the Pool Operator Manual.
3. Waterborne diseases are not the only concern,
_____ respiratory irritations and diseases are also a
risk.
4. Endemic Granulomatous Pneumonitis is also called _____ lung.
5. _____ and _____ are the leading cause of accidents in
YMCA pools annually.
6. The severe weather policy should contain recommendations for three areas:
 1. _____

2. _____
3. _____

Safe Handling, Use and Disposal of Pool Chemicals

Toxicity and Health

1. Pool chemicals can enter the body four ways:
 1. _____, 2. _____, 3. _____, 4. _____
2. Acute effects of a chemical that are harmful occur from a _____
_____ to a pool chemical by any entry route.
3. Chronic effects that are harmful occur from _____ of a chemical
_____.

Material Safety Data Sheets

4. MSDS sheets include all essential information about a substance including

5. P.E.L. is the _____,
which is the maximum legal exposure to a chemical during an _____
_____ and a _____ hour week.
6. The safe application section of an MSDS form includes precautions such as
showering after _____,
ventilation needed in the _____ and _____
clothing.

Hazard Communication Standard (Employee Right-to-Know)

7. The HCS has requirements in four major areas
1. _____
 2. _____
 3. _____
 4. _____

First Aid for Pool Chemical Poisoning

9. If clothing is contaminated, _____ it immediately. Thoroughly _____ the skin in the affected area with _____.

Safe Storage and Use of Pool Chemicals

10. Store chemicals in their _____.
11. Wear appropriate protective _____ and _____.
12. Keep plenty of _____ and _____ nearby.
13. Dispose of empty containers according to _____ instructions.

Handling Chemical Spills

14. The pool manager's responsibility for chemical spills focuses on 3 C's: _____, _____ and _____ up the spill.

Keeping Records

15. Pool managers must keep records of all chemical applications for _____
_____.

Pool Facility Maintenance

1. A _____ is a device on an electrical outlet that detects any electric leak or surge around the pool and automatically and instantaneously cuts off electric power.
2. Emergency shut off switches on slides should be located on the platform at the _____ of slide.
3. _____ is required on all electrically equipment.

Play Elements

1. Constant-Blow Inflatable have air blower permanently connected and constantly _____ while the inflatable is in use.
2. Positioning of an inflatable water slide list the four criteria;
 1. _____
 2. _____
 3. _____
 4. _____
3. Slide safety precautions differ according to the _____ of slide being operated.
4. Interactive playgrounds – water spray and reused should have some form of recirculation and _____ disinfectant system.
5. Zero–depth entry pools, safety rules include:

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