

1 Exam Prep

Pool and Spa Operator Handbook, 2014

1 Exam Prep Tabs and Highlights

These 1 Exam Prep Highlights are based on the *Pool and Spa Operator Handbook, 2014 Edition*.

Each Tabs sheet has five rows of tabs. Start with the first tab at the first row at the top of the page; proceed down that row placing the tabs at the locations listed below. Place each tab in your book setting it down one notch until you get to the last tab (usually the index or glossary). Then start with the highlights.

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This concludes the tabs for this book. Please continue with the highlights below.

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3	Failure to comply with the following items should result in immediate pool or spa closure: “Pool/spa main drains must be visible, properly attached, and fully intact.” (Bullet #5)
6	Negligence: “Negligence is the failure to act in accordance with the corresponding standard of care.”
14 -15	Material Safety Data Sheets: “Chemical manufacturers and importers are required to evaluate the hazards and standards of chemicals they produce or import and provide details about them. The MSDS must be available to all workers at the job site where the chemical is used.”
25	Figure 3-1: Useful Conversions
27	Calculating Surface Area and Gallons and Liters (see Figure 3-3) – know formula for a circle
28	Calculating Gallons in a Multi Depth Pool Formula (See Figure 3-4a)
30	Calculating Gallons in 1 Inch of Depth Formula (See Figure 3-5)
31	Calculating Gallons in a Multi-Depth Circular Spa (see Figure 3-6a)
38	Fecal Response: “for any type of AFR (accidental fecal release), direct all users to leave the pool.”

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39	Formed stool: “Raise the free chlorine level to 2 ppm.”
	Diarrheal Discharge: “Raise the free chlorine to a level of 20 ppm.” “Maintain the pH and chlorine level for 12.75 hours.”
41	Legionella Pneumophilia: “is transmitted by the mists (breathable droplets)”
49	Combined Chlorine: “Chloramines evaporate and are the cause of the chlorine-like smell often witnessed in indoor pools. Chloramines are also more irritating to skin and mucous membranes.”
50	Characteristics of Disinfectants: Table 5-2
	Disinfectants: “Chlorine and bromine are they most commonly used. These two disinfectants are highly reactive and provide residual properties that ensure continuous, efficient control of microorganisms.”
53	Cyanuric Acid: “The free chlorine (FC) provide by unstabilized chlorine compounds can be protected from the effects of UV light by the addition of cyanuric acid (Cya).”
	Stabilized Disinfectants: “The pH of trichlor is 2.8-3.5 and will lower the total alkalinity and pH over time.”
62	To increase pH: “Sodium bicarbonate should not be used to raise pH on a regular basis.”
63	Total Alkalinity: “When cyanuric acid is high, the interference to total alkalinity should be subtracted from the total alkalinity before the saturation index is calculated.”
	Low Total Alkalinity: “To increase total alkalinity, labels typically recommend adding sodium bicarbonate at the rate of 1.4 pounds per 10,000 gallons.”
64	High Calcium Hardness: “high levels of calcium hardness can result in several problems: rough pool/spa surfaces that can harbor bacteria or scratch skin, clogged filters, cloudy water, clogged heater elements, and reduced circulation.”
66-68	Saturation Index: Highlight Saturation Index formula and Saturation Index Factors in Illustration 6-7. (See Examples 6.1, 6.2, and 6.3)
70-71	Product Label Chemical Adjustment (See Example 7-1a, 7-2a). Note: Use Appendix B-3 Worksheet

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70-72	NO Product Label Chemical Adjustment. Follow the four steps, using the chemical adjustment worksheet. (See Example 7-3a). Note: Use Appendix B-3 Worksheet and Appendix B-2 for calculation
74	Combined Chlorine, water and Air Quality: “Combined chlorine is the difference between total chlorine and free chlorine.” See formula. “There are several treatment methods to consider as options to reduce or prevent chloramines: water replacement, breakpoint chlorination, ultraviolet, ozone, potassium monopersulfate, indoor air handling.”
75	Formula to calculate amount of chemicals needed to achieve breakpoint chlorination (See example 7-4a)
78	Green or Blue Green Water: “A turbid green pool is usually the result of an algae problem.”
86	Colorimeter (Photometer): “Since lighting conditions and personal considerations are no longer a factor, photometer testing is considered to be more accurate than comparator and titrimetric testing.”
88	Collecting the Sample: “The sample should be taken from a depth of at least 18 inches below the water surface and from a location well away from any return inlets.”
91	DPD Testing: “The titration test, called Ferrous Ammonium Sulfate-DPD (FAS-DPD).”
93	Oxidation Reduction Potential (ORP): “expressed in milivolts mV.”
94	pH Testing: “The pH of pool and spa water is usually measured by adding phenol red indicator to a pool water sample.” pH Adjustment Testing: “Many test kit manufacturers offer a convenient method of determining the proper amount of chemicals to add to correct for an improper pH condition. This involves two additional reagents known as Base demand Reagent or Acid Demand Reagent.”
95	False Total Alkalinity Readings: “High levels of chlorine can result in an end point different from the expected reddish-pink color. The result is usually a yellow or aqua-green color.”
103	Dry Chemical Feeders: “Erosion feeders use a stream of water to contact the dry chemical, causing the chemical to erode and dissolve.”

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106	Photo 9-8: “A new lead gasket is always used anytime the chlorinator is removed from the cylinder.”
117	“Circulation is influenced by:” (4 bullets)
119	Flow Rate: “Flow rate is measured with a flow meter installed on the return flow line downstream from all equipment and just before water is returned to the pool.” Highlight formula to calculate flow rate
120	Suction Side Elements and Entrapment: “These covers should be installed so that the maximum flow rating is not exceeded.”
121	Surface Water Removal: “The commonly accepted practice is that 75% of the water be removed from the surface.”
125	Vacuum Gauges: “A vacuum gauge is located just prior to the pump.”
127	Total Dynamic Head
130	Illustration 10-9: Sample color-coding for pool and spa piping.
130-131	”To assist the pool operator in performing the daily maintenance requirements, all circulation components should be labeled, tagged, or even color coded.
133	Return Inlets: “The method and placement of the return inlets are critical to the overall development of flow patterns within the pool.”
137	Filter Media: - Sand Filtration - Cartridge Filtration
138	Diatomaceous Earth: “DE removes the smallest particle size of any pool/spa filtration.”
139	Filter Media Rate (FMR) Filter Area Sand Filters: Channeling can bypass the filtration process, resulting in unfiltered water returning directly to the pool.”

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140	Highlight formulas to determine: Filter Area (FA), Filter Media Rate (FMR), and Flow rate (FR). (See Examples 11-1 and 11-2)
141-142	High-Rate Sand Filtration: “Freeboard is critical because it allows the sand bed to expand during the backwash cycle... This amount of sand will leave the proper freeboard.” (Entire paragraph)
143	Backwashing Sand Filters: “If there is only one pressure gauge, the filter should be backwashed when the pressure increases 8 to 10 psi over the starting pressure.”
143-144	“For new sand, most of the small sand particles or “fines” are removed while the supplier is processing and washing sand... It is important that the “fines” are removed so that oils do not adhere to them, causing premature “mud balls.”
145	Cartridge Filtration: “Cartridge filters do not require backwashing to clean the cartridge so water is conserved.”
146	Handling D.E. powder: “The pool operator should use great care in the storage and handling of DE powder.”
147	Pre-coating Vacuum DE: “concerning the amount of DE to use. The normal amounts range from 1 to 1.5 pounds for every 10 square feet of filter area.”
151-152	Evaporative Losses: “Evaporation is increased by high wind speeds, high air temperature low relative humidity, and high water temperature.”
163	Safe Use Guidelines: “The Consumer Product Safety Commission recommends...” “Keep the temperature of the water in the spa at 104 F or lower.”
167	Disinfectants: “For bromine, the suggested ideal total bromine level is 4.0 to 6.0 ppm (mg/L).”
169	Calcium Hardness: “The ideal calcium level for a hot water facility is 150 to 250 ppm.”
171	Water Replacement: The general guideline is to replace the water if the TDS increases by 1,500 ppm above the start-up water TDS.”
174	Barriers: “Openings in the barrier should not allow passage of a 4-inch diameter sphere or disk.”
175	Safety Covers: “the cover should be able to hold a weight of 485 pounds.”

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184	Safety and Rescue Equipment: List/highlight safety and rescue equipment that should be easily accessible around the pool. “A US Coast Guard approved ring buoy.”
187	Chemical Safety and Storage: “Pool chemicals may become a hazard when contaminated by a small quantity of water or when they are improperly mixed or contaminated.”
191	Protective Measures: See bullet #2: “Use basic PPE including, as a minimum, chemical goggles and liquid impervious gloves and boots for any chemical handling activities.”
194	Preventing Electrocutions
	Lock Out/ Tag Out
200	Opening and Closing Checklist: “Unsafe conditions should be noted and corrected before the facility opens.” “The following is a starting point to review when the facility is opened or closed: All self-locking gates operate as expected.” (Bullet #6)
201	Routine Maintenance Schedules: “is usually performed prior to the opening of the facility each day.”
203	Emergency Response Plans: “The plan must contain staff training requirements, alarm signals and their meanings, and the actions and procedures of how the facility expects the staff to respond in all emergency situations.”
221	Trouble Shooting Sand Filters: cause of sand returning into the pool
258	B-1: Water Chemistry Guidelines
260	B-2: Water Chemistry Adjustment Guide
261	B-3: Water Chemistry Adjustment Worksheet
266	C-1: Turnover and Flow Rates “Approved drain covers have specific flow rates that must not be exceeded.”
273	C-2: Revised ADA Act: “At least two accessible means of entry shall be provided for swimming pools.”
289	Turbidity: Highlight definition