**Section 820.210 Swimming Facility Water Treatment System**

a) General Requirements

1) A water treatment system, consisting of pumps, piping, filters, water conditioning, disinfection equipment and other accessory equipment shall be provided to clarify, chemically balance and disinfect the swimming pool water. The system shall be designed for a recirculation flow rate that will result in a turnover period in each pool not exceeding those specified below. Systems serving pools with skimmers shall be designed for a flow rate of at least 30 gallons per minute for each skimmer.

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| --- | --- |
| Type of Pool | Maximum Turnover Period |
|  |  |
| Diving Pools | 8 Hours |
| Wading Pools, Wading Areas | 2 Hours |
| Plunge Pools and Plunge Areas for Water Slides | 2 Hours |
| Lazy Rivers | 2 Hours |
| Other Pools | 6 Hours |
| Spas | 30 Minutes |

2) Other than equipment for circulating, heating, filtering and chemically treating water, as specified in this Section, or for automation of water quality control, no other type of device may be used as part of a pool water treatment system.

b) Pumping Equipment

1) The recirculation pump shall deliver the flow necessary to obtain a turnover as specified in subsection (a). A valve for regulating the rate of flow shall be provided in the recirculation pump discharge piping.

2) The pump shall provide a minimum backwash rate of 15 gallons per minute per square foot of filter area in sand filter systems. The pump shall supply the required recirculation rate at a total dynamic head of at least 50 feet for all vacuum filters, 70 feet for pressure sand or cartridge filters, or 80 feet for pressure diatomaceous earth filters, unless a lower head is shown by the designer to be hydraulically appropriate.

3) If the pump operates with static suction lift, it shall be self-priming.

4) Where vacuum filters are used, a vacuum limit switch shall be provided on the pump suction line. The vacuum limit switch shall be set for a maximum vacuum of 18 inches of mercury.

5) A compound vacuum-pressure gauge shall be installed on the pump suction line as close to the pump as possible. A vacuum gauge may be used for pumps with suction lift. A pressure gauge shall be installed on the pump discharge line adjacent to the pump, with no valves between the pump and the gauge. Gauges shall be installed where they can be easily read.

6) Hair and Lint Strainer. A hair and lint strainer shall be installed on the suction side of the pump except on vacuum filter systems. The strainer basket shall be easily removable. Valves shall be installed to allow the flow to be shut off during cleaning, switching baskets, or inspection.

c) Water Heater. A water heater shall be installed at all indoor pools. Pool water heaters shall be installed in accordance with the manufacturer's recommendations.

1) The heater piping system shall be equipped with a valve bypass pipe around the heater, sized for the swimming pool design flow rate. The influent and effluent heater piping shall be valved, and shall conform to material specifications as approved for water distribution applications in the Illinois Plumbing Code.

2) A heating coil, pipe or steam hose shall not be installed in a swimming pool.

3) Thermometers shall be provided in the piping to check the temperature of the water returning from the pool and the temperature of the blended water returning to the pool.

4) The design of the water heating system shall prevent the introduction of water in excess of 115° F. to the pool.

5) A pressure relief valve with a maximum pressure rating of 75 pounds per square inch and having a thermal capacity at least equal to the heat input rating of the heater shall be provided, with the discharge piped to within 6 inches of the floor.

6) Gas or other fuel-burning water heaters shall be vented to the outdoors.

7) Heaters for indoor pools shall be capable of maintaining a minimum pool water temperature of 76° F.

8) Combustion and ventilation air shall be provided for fuel-burning water heaters as required by the heater manufacturer.

9) Heaters for indoor swimming pools shall be sized on a basis of 150 British Thermal Units (BTU) per hour input per square foot of pool water surface area.

 (1 kilowatt = 3,412 BTU/hr.)

10) Heat exchangers used to heat pool water by use of a toxic transfer fluid, as defined in Section 890.120 of the Illinois Plumbing Code, shall be of double-wall construction, with the space between the two walls having a drain open to the atmosphere.

d) Flow Meter. Flow meters shall be located so that the rate of recirculation and the backwash rate of sand filters can be read. In a multiple pool system, flow meters shall be provided for each pool. Separate flow meters shall be provided to monitor the flow for each area of a pool with a turnover rate that differs from adjacent areas according to subsection (b)(1). Flow meters shall be provided on inlet supply piping in accordance with subsection (f)(2)(G). Flow meters shall be installed on a straight length of pipe with no valves, elbows or other sources of turbulence within 10 pipe diameters upstream or 5 diameters downstream from the flow meters. (See Appendix A.Illustration G.)

e) Vacuum Cleaning System

1) A vacuum cleaning system capable of reaching all parts of the pool floor shall be provided.

2) When the vacuum cleaning system is an integral part of the pool recirculation system, the wall fitting shall connect to the suction side of the pump ahead of the hair and lint strainer. Vacuum outlets in pools shall be equipped with covers that automatically close and latch when the vacuum hose is removed. A shut-off valve shall be installed in the piping. The suction outlet fitting shall comply with IAPMO SPS.

f) Piping, Skimmer and Overflow System

1) Piping

A) The pool recirculation piping shall comply with Section 890.Appendix A.Table A of the Illinois Plumbing Code for water service pipe or water distribution pipe.

B) The piping shall be designed to carry the required flow at velocities not exceeding 5 feet per second in suction piping, and 10 feet per second in pressure piping, unless greater velocities can be hydraulically provided. Gravity piping shall be sized so that the head loss in piping, fittings, valves, etc., does not exceed the head available during normal operating conditions.

C) The following waste lines shall be provided with 6-inch air gaps at their points of discharge to the waste sump or sewer:

i) Main drain bypass or other connections to waste;

ii) Sub-surface drains or deck drains around a pool that discharge to a sanitary or combined sewer;

iii) Filter backwash or drain lines and overflow lines;

iv) Surge tank drain and overflow lines;

v) Pump discharge to waste lines; and

vi) Gutter bypass to waste lines.

2) Inlets

A) Inlets for filtered water shall be located and directed to produce uniform circulation of water to maintain a uniform disinfectant residual throughout the entire pool without the existence of dead spots, and to produce surface flow patterns that effectively assist skimming. In pools with skimmers, inlets installed where the water depth is 18 inches or more shall be installed in the pool wall at a depth of 8 inches to 16 inches below the mid-point on the skimmer throat. Each inlet installed in a wall of a pool where skimmers are used shall be directional.

B) The velocity of flow through any inlet orifice shall be in the range of 5 to 20 feet per second, except that in pools equipped with skimmers it shall be in the range of 10 to 20 feet per second. Velocities for various flows are shown in Appendix B.Table C.

C) Inlets installed in pool walls shall be spaced as follows:

i) In the shallow end wall, each inlet shall serve a linear distance of no more than 8 feet. In the deep end wall, each inlet shall serve a linear distance of not more than 15 feet.

ii) In pools with a water surface area greater than 1,500 square feet or length in excess of 60 feet, additional inlets shall be provided along side walls at no more than 15-foot intervals.

iii) The location of inlets in pools with skimmers may vary from the requirements of this subsection (f)(2)(C) to allow locations that will assist in skimming.

D) At least one inlet shall be located in each recessed stairwell or other space where water circulation might be impaired.

E) Where floor inlets are used, inlets shall be uniformly spaced at a distance of no greater than 20 feet apart, and rows of inlets shall be within 15 feet of each side wall. Floor inlets shall be flush with the pool floor and shall include a diffuser plate to evenly distribute the flow in all directions.

F) Floor inlets are required in wading areas that are more than 30 feet in width.

G) If both wall and floor inlets are used in a swimming pool, the wall inlets and the floor inlets shall be supplied by separate piping, with valves and flow meters installed in each so that the flow can be individually regulated and monitored.

3) Outlets

A) Each pool shall be provided with a main drain system installed at the deepest point, which shall be connected to the pool recirculation system. For multiple-purpose pools, with a floor consisting of more than one drainage area, at least one drain shall be provided in each basin, so that each portion of the pool floor is sloped to drain.

B) Main drains shall be spaced not less than 3 feet apart, nor more than 30 feet apart, nor more than 15 feet from side walls, and shall be connected in parallel.

C) A hydrostatic relief valve shall be provided for in-ground pools.

D) Main drain piping shall be sized for removal of the water through it at a rate of at least 100 percent of the design recirculation flow rate. The piping system shall be valved to permit adjustment of flow through it.

E) If the pool cannot be drained completely through the main drain, a portable pump that will effect complete pool drainage shall be provided.

F) Each outlet, including main drains and suction outlets, but not including skimmers, shall be covered with a certified safety cover having openings not exceeding ½ inch that is not removable without the use of tools or meets the requirements of subsection (f)(3)(K). The water flow rate through certified safety covers shall not exceed the maximum flow rate recommended by the manufacturer.

G) Suction outlets shall be equipped with a certified safety cover with dimensions of at least 18 by 23 inches or 29 inches diagonally, or the suction system shall include a minimum of two hydraulically balanced outlets spaced at least 3 feet apart, center to center. In a spa, the two outlets may be installed closer than 3 feet apart if installed on different surfaces, e.g., one outlet in the floor and one in a wall.

H) For systems with multiple suction outlets, the sum of the maximum flow rates for the covers shall be at least twice the system maximum flow rate. This requirement shall not apply to systems in which each suction outlet is at least 18 inches by 23 inches or 29 inches as measured diagonally.

I) A suction outlet shall not be installed on a horizontal surface of a stair or seat.

J) Suction outlets and certified safety covers shall be installed in accordance with the manufacturer's requirements. For suction outlets with field-fabricated sumps or other sumps not specified by the manufacturer of a certified safety cover installed on the outlet, there shall be a spacing of at least 1½ pipe diameters between the outlet pipe or fitting and the bottom of the cover.

K) Field-fabricated suction outlets that are at least 18 inches by 23 inches in size shall be certified for compliance with ANSI/APSP 16 by a professional engineer licensed to practice in Illinois. The Licensed Professional Engineer shall provide documentation of the testing and a certification document to the property owner. The Licensed Professional Engineer shall certify a maximum flow rate for each outlet. Copies of all documentation shall be retained on the swimming facility premises for inspection by the Department.

L) The following documentation is required to certify a field-fabricated suction outlet for compliance with the ANSI/APSP 16 standard:

i) The suction fitting shall not protrude from the installed surface more than 2 inches.

ii) The maximum allowable flow through the cover shall be calculated and specified.

iii) The maximum system flow rate for the pool pump shall be specified.

iv) The design of a field-fabricated suction outlet shall be specified by a licensed engineer to fully address the considerations of cover/grate loadings; durability; hair, finger and limb entrapment issues; cover/grate secondary layer of protection; related sump design; and other features specific to the site.

v) Field-fabricated suction outlets shall have the following information specified by the licensed engineer: compliance with ANSI/APSP 16; statement of single or multiple drain use; maximum certified flow rate; installed life of the fitting in years; installation position of the outlet (wall or floor); and instructions on installation and service for the fitting.

4) Perimeter Overflow Systems

A) Pools that have a width exceeding 30 feet shall have a continuous perimeter overflow system.

B) A perimeter overflow system shall:

i) Extend completely around the pool except that interruptions not exceeding 25 percent of the pool perimeter nor 30 feet each may be allowed for steps, water slide entries, and side walls adjacent to zero-depth edges;

ii) Permit inspection, cleaning, and repair;

iii) Be designed so that no ponding or retention of water occurs;

iv) Be designed to prevent the entrapment of bather's arms, legs and feet;

v) Except at a zero-depth edge, have an overflow lip that provides a good handhold and is level to within ⅛ inch. At a zero-depth edge, a trench drain covered with a slip-resistant grating installed flush with the pool deck and with the pool floor, and level to within ⅛ inch measured along the pool perimeter, shall be provided;

vi) Provide for the removal of all surface debris skimmed from the pool;

vii) Be designed for removal of water from the pool surface at a rate of at least 100 percent of the design turnover flow rate;

viii) Discharge to the recirculation system;

ix) Be provided with drains and piping that will not allow the overflow channel to become flooded when the pool is in use; and

x) Have drain gratings with open area at least equal to two times the area of the outlet pipe and that can be removed for cleaning.

C) Surge Capacity. Perimeter overflow systems shall be provided with a surge capacity of at least 0.6 gallon per square foot of pool water surface area. Surge capacity shall be provided either in a vacuum filter tank, a surge tank, or combination of vacuum filter tank and surge tank. Valving shall be provided to maintain the proper operating water level in the pool.

5) Skimmers. Skimmers are permitted on pools where the width does not exceed 30 feet. If skimmers are provided, the following shall be met:

A) At least one skimmer shall be provided for each 500 square feet of water surface area or fraction of that area;

B) Skimmers shall be located to optimize skimming;

C) Each skimmer and piping shall be designed to be capable of providing a flow-through rate of not less than 30 gallons per minute;

D) Skimmers shall be piped to provide approximately equal flow through each skimmer;

E) The surface skimmer piping shall have a valve to permit adjustment of flow through it;

F) If an equalizer pipe is installed, the skimmer shall be equipped with a valve that will restrict flow through the equalizer pipe during normal operation of the skimmer. The equalizer pipe shall be connected to the main drain pipe;

G) The skimmer shall be tested in accordance with NSF Standard 50 and listed by an approved certification agency;

H) Skimming devices shall be built into the pool wall;

I) A basket that can be removed without the use of tools, and through which all overflow water must pass, shall be provided; and

J) The skimmer shall be provided with a floating weir and shall operate at variations in water level over a range of at least 4 inches.

g) Make-up Water. Make-up water shall be added through a fixed air gap of at least 6 inches to the pool, surge tank, vacuum filter tank, or other receptacle. When make-up water is added directly to the pool, the fill-spout shall be located under a low diving board or immediately adjacent to a ladder rail, grab rail, or fixed lifeguard chair. There shall be no connection between a therapy pool or associated water treatment system and a swimming pool or its recirculation system.

h) Filtration

1) Filters shall be certified to comply with NSF Standard 50 and listed by an approved certification agency. The design filtration rate in the particular application in which the filter is used shall not exceed the maximum design filtration rate for which the filter was certified. An official certification label from the certifying agency shall be permanently affixed to the filter.

2) Pressure gauges that indicate the inlet and outlet pressures of pressure filters shall be installed.

3) For pressure filters, an observable free-fall discharge, sight glass or other means of determining the clarity of backwash water shall be provided.

4) Overflow piping shall be connected to vacuum filters if the rim of the filter tank is below the pool water level. Drain piping for vacuum filter tanks shall be provided.

5) The backwash rate for sand filters shall be at least 15 gallons per minute per square foot of filter area. A lesser backwash rate may be allowed when air scouring is used in accordance with the filter manufacturer's specifications.

6) A filter backwash disposal facility, designed so that flooding, overflowing or excessive splashing does not occur when the filter is backwashed at the required flow rate, shall be provided where filters designed to be backwashed are used.

7) A filter pre-coat pot or funnel shall be installed on the pump suction piping when diatomaceous earth filters are used, unless a pre-coat pot is provided as an integral part of the filter. The filter piping shall allow recycling or disposal of filter effluent during the pre-coating operation.

8) If continuous feeding of diatomaceous earth is used with a vacuum diatomaceous filter to permit a design filtration rate higher than would otherwise be allowable, equipment capable of feeding diatomaceous earth at a rate of at least 1.5 ounces per day per square foot of filter area shall be provided.

9) Filter media for sand filters shall be as specified by the filter manufacturer.

10) Prior to disposal, wash or backwash water from diatomaceous earth filters shall be passed through a separation tank designed for removal of suspended diatomaceous earth and solids.

i) Chemical Feeders

1) Equipment Capacity

A) Chlorine. Equipment for supplying chlorine or chlorine compounds shall be of sufficient capacity to feed chlorine at a rate of 8 parts per million (p.p.m.) for outdoor pools and three parts per million for indoor pools, based on the flow rate required by the table in subsection (a). Feed rates for various chlorinators and solutions are shown in Appendix B.Table D.

B) Bromine. Equipment for supplying bromine shall be capable of delivering at least 15 p.p.m. for outdoor pools and 5 p.p.m. for indoor pools based on a minimum design flow rate as required by the table in subsection (a).

C) Ozone

i) Ozone may be used as a supplement to chlorination or bromination as required in subsection (i)(1). Ozone-generating equipment and its components shall be tested in accordance with NSF Standard 50 and listed by an approved certification agency.

ii) The ambient air ozone concentration shall be less than 0.10 p.p.m. in the vicinity of the ozonator and at the pool water surface. Ambient ozone monitors shall be installed in the equipment room, in the vicinity of the ozone-generating equipment, and, when the ozonation system is used at an indoor swimming pool facility, in the swimming pool enclosure. Audible and visual alarms that are activated by ozone concentrations in excess of .10 p.p.m. shall be connected to the ozone monitor. The ozone-generating equipment shall automatically shut off when the ozone concentration in the air exceeds 0.30 p.p.m. or when the pool recirculation flow is interrupted.

iii) All corona discharge systems shall include a method for removing ozone in the water in excess of 0.1 p.p.m. prior to return to the pool.

2) Positive Displacement Pumps (Hypochlorinators). Positive displacement pumps that are used to inject the disinfectant solution into the recirculation line shall be of variable flow type, shall be of sufficient capacity to feed the amount of disinfectant required by subsection (i)(1), and shall be installed so that feeding of chemicals is interrupted whenever the swimming pool recirculation flow is interrupted. Positive displacement pumps for feeding chlorine compounds or chemicals for control of pH shall be certified by a certified laboratory to conform to NSF Standard 50. If calcium hypochlorite is used, the concentration of calcium hypochlorite in the solution shall not exceed 5 percent by weight. The solution container shall have a minimum capacity equal to the volume of solution required per day at the feed rate required in subsection (i)(1).

3) Gas Chlorinators

A) The chlorine supply and gas-feeding equipment shall be housed in a separate, relatively air-tight room with an out-swinging door. The room shall be provided with an exhaust system that takes its suction not more than 8 inches from the floor and discharges outdoors in a direction to minimize exposure to toxic fumes. The fan shall be capable of producing one air change per minute. Openings such as filters or grill openings at a high point opposite the exhaust fan intake shall be provided for introducing a fresh air supply to the enclosure. The intake to the make-up air supply shall be located where the discharge from the exhaust system will not be drawn back into the room. The room shall have a window with an area of at least 100 square inches and shall have artificial lighting. Electrical switches for lighting and ventilation shall be outside and adjacent to the door. Scales for weighing chlorine cylinders in service shall be provided.

B) The chlorine-feeding device shall be designed so that gas feed is automatically terminated during interruptions of the flow of the water supply. In addition, the release of chlorine shall be terminated when the recirculation pump is shut off. Where other than swimming pool recirculated water is used, the supply line shall be equipped with an electric shutoff valve wired to the recirculation pump and shall be equipped with a suitable backflow preventer. (See Appendix A.Illustrations L and N for methods of installation.)

C) Chlorinator vent lines shall terminate outdoors. A screen made from a chlorine-resistant material shall be installed where the vent line terminates outdoors to exclude insects.

D) The gas chlorinator shall be the solution feed type capable of delivering chlorine at its maximum rate without releasing chlorine gas to the atmosphere.

E) The water supply for the gas-feeding equipment shall produce the flow rate and pressure required according to the manufacturer's specifications for proper operation of the equipment.

4) pH Control Feeders. At pools with a volume greater than 100,000 gallons, or pools using gas chlorine as a disinfectant, a chemical feed system shall be installed to maintain the pH of pool water within the range of 7.2 to 7.6. The system shall be installed so that the feeding of the pH controlling chemical is automatically interrupted whenever the swimming pool recirculation flow is interrupted. A solution tank of at least 15 gallons capacity shall be provided and shall be marked as containing a chemical to control pH. Alternatively, a system incorporating a cylinder of carbon dioxide and injecting mechanism may be employed to lower pH.

5) Erosion-Type Chemical Chlorine Feeders

A) Erosion type chlorine and bromine feeders shall be tested in accordance with NSF Standard 50 and listed by an approved certification agency.

B) Only the chemical specified by the feeder manufacturer shall be used as the disinfecting agent.

C) Erosion type chemical feeders shall be installed in accordance with the equipment manufacturer's instructions.

6) Copper/Silver and Copper Ion Generators. All copper/silver and copper ion generators shall be tested in accordance with NSF Standard 50 and listed by an approved certification agency and may be used only as a supplement to chlorination or bromination as required in subsection (i)(1).

(Source: Amended at 37 Ill. Reg. 16539, effective October 4, 2013)