

Technical Information

Extract From Spata

- ◆ The three types of sand filtration work on the same basic principle with the major difference being the water flow rate through the sand as below

Low Rate	upto 10m³ /m²/hr		Medium Rate	11-30m³ /m²/hr		High Rate	31-50m³ /m²/hr
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- ◆ Flow rate for back wash should not be lower than 30m³/m²/hr.
- ◆ Low rate sand systems require media of particle size 0.83mm to 1.3 mm.
- ◆ Medium and high rate systems require media of particle size 16/30.
- ◆ Cartridge filters use a system where the filter internal is re-usable, which removes up to 5 microns.
- ◆ The removal of the water from the surface of the pool is an important factor as 70-75% of impurities, e.g. body oils, in the water are found within the top 75mm.
- ◆ Drains located at the deepest point of the pool (with suction to ensure velocity is not likely to endanger bathers).
- ◆ Surface water skimmers or Overflow channels when deck level design is used with suitably designed outlets to the balance tank.
- ◆ Return inlets, sized accordingly to the flow rate volume, capable of passing the total design flow rate (100%). Screws and fittings should be tamper proof with secure face plates.
- ◆ Water inlets and fittings should be constructed of non-corroding material and protected by a suitable grille with a maximum width between bars of 8mm
- ◆ Where more than one skimmer is employed, the pipe sizing shall be so balanced as to ensure the optimum efficiency of each skimmer at all times. It should be possible to control each individual skimmer at all times.
- ◆ On a skimmer system – recommendations are for 70% - (surface) 30% (main drain) ration. 70:30
- ◆ On a level deck system this recommendation changes to a minimum 50%:50%ratio to a maximum 80%:20%ratio
- ◆ The main outlet drains should be constructed of non-corroding material, and each should be protected by a suitable grille. The maximum distance between the bars of the grille must not exceed 8mm (6/16 in). At least two outlets should be provided at the lowest point of the floor to drain the entire floor area completely.
- ◆ The spacing between 2main drain outlets should not be greater than 2m apart on centres and not more than 3m from each side wall.
- ◆ For safety reasons, it is recommended that the flow rate for the sump is split between at least 2 sumps to ensure velocity is not such to create a danger to bathers. The size of the grille should be as large as possible creating a slow even flow through a large area and thus preventing entrapment. A grille gap of 8mm max is advised.
- ◆ Vacuum fitting(s) shall be located in an accessible positions(s) below the water line and shall be constructed of non-corroding material. A sealing plug should be fitted when not in use.
- ◆ Except when provided as a massage jet or rapid flow inlet, no inlet should provide a velocity greater than 2.4/2.745m/sec in private pool conditions, 1.5-2m/sec in commercial pool conditions

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- ◆ Class C (6 bar) is considered suitable for standard residential use whilst for underground pipework for commercial pools and in case of specific stress Class E (16 bar) should be used with following pipe velocities.
- ◆ Suctions Velocity (maximum 1.2 meters/sec)
- ◆ Return Velocity (maximum 2.0 meters/sec)
- ◆ Grille Velocity (maximum 0.3 meters/sec)
- ◆ The sizing of the Balance Tank will depend on several, often conflicting, criteria. The tank is provided to hold a volume of water, in excess of the pool volume, to compensate for the displacement of water when bathers enter the pool.
- ◆ All pipe work shall be hydraulically tested to a minimum pressure of 10-15 psi (residential) or 35-45 psi (commercial) with a maximum equivalent to 1 ½ times the shut off head of the pump and this pressure shall be maintained for a period of 30 minutes.
- ◆ While installing , Sanitiser should be dosed before the filters in the circulation system to avoid mixing with pH control agents and to provide disinfection to the filters.
- ◆ PH agents should be introduced after the heat exchanger to avoid mixing with the sanitiser and avoid corrosion of the heat exchanger elements.
- ◆ For heated pool, 28°C -30°C (82°F-86°F) appears to be the most common requirement.
- ◆ The standard maximum flow rate and water turnover rates shall be
- ◆ Commercial pools - 25m³ /m²/hr with 3 hours water turnover rate
- ◆ Private pools - 50m³ /m²/hr with 8 hours water turnover rate
- ◆ The following table (when used in conjunction with other design criteria) should prove helpful in the sizing of a filter plant.

TYPE OF POOL

Turnover period in hours

Leisure water bubble pools/Spas	0.1 – 0.33
Teaching Pools/ Waterslide splash pools	0.5 – 1
Leisure waters up to 0.5m deep	0.2 – 0.6
Leisure waters up to 0.5 – 1m deep	0.6 – 1.2
Leisure waters 1 – 1.5m deep	1 – 1.8
Conventional public pools up to 25m long	2.5 – 3
Competition pools 50m long	3 – 4.5
Domestic Pools/ Diving pools	4 – 8

Technical Information

Balanced Water Analysis

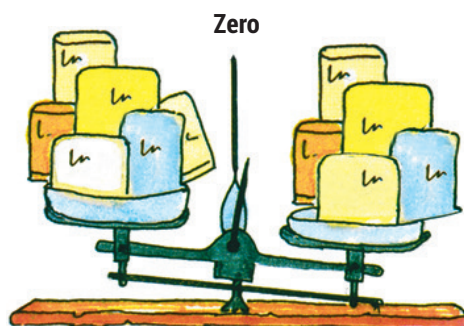
When a water is in balance, it is said to be neither corrosive nor scale-forming. In other words, it will not deposit a layer of calcium scale neither will it dissolve an existing layer of scale.

For most well run pools, the water will be in balance if the pH value is kept within the recommended range, but other factors should be taken into account which can affect the condition of the water. These are the total alkalinity, the calcium hardness, the TDS content and lastly, the temperature of the water. The concentration of chlorine or bromine do not appear in the Balanced Water Calculation.

- ◆ In soft water areas where the constant addition of calcium is necessary to maintain a calcium level above the minimum, it could be advantageous to use calcium hypochlorite as the chlorine donor in order to obtain the calcium in addition to the chlorine from this product.
- ◆ Also where the natural total alkalinity is low, the use of carbon dioxide gas for pH correction with calcium hypochlorite would be advantageous to produce an increase in the total alkalinity.
- ◆ In hard water areas where it may be difficult to reduce total alkalinity and pH to the recommended range, the use of hydrochloric acid (muriatic acid) may be necessary and it may be appropriate to operate with a total alkalinity of around 140 – 150 mg/l.

- Balance = Corrosive

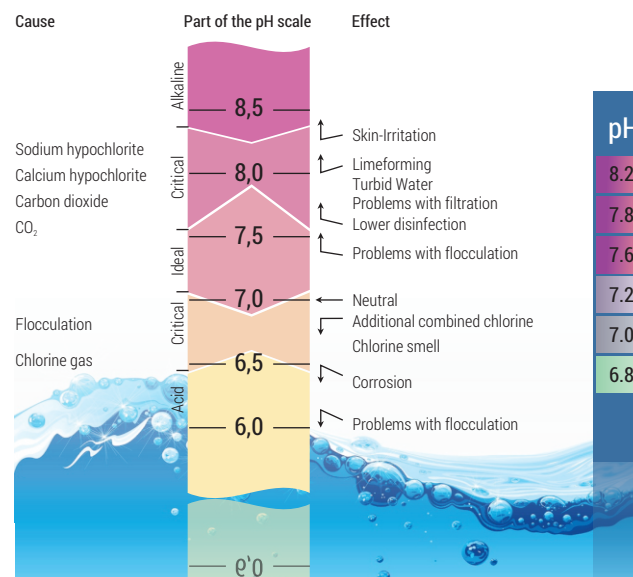
- Low pH
- Low Alkalinity
- Low Calcium Hardness
- Low TDS
- Low Temperature



+ Balance = Scale Forming

- High pH
- High Alkalinity
- High Calcium Hardness
- High TDS
- Low Temperature

Causes and effects of pH values



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Trouble Shooting Guide for Swimming Pool Water

Symptom	Problem	Possible Causes
Green Pool	Algae	Low free chlorine level High stabiliser
Chlorine smell / stinging eyes	Unpleasant bathing	Low or no free chlorine Incorrect pH
Cloudy Water	Suspended particles in water	High pH and or alkalinity Low free chlorine level High stabiliser Poor or inadequate filtration
Coloured water	Excess minerals or metals in water	Overdose of copper based algicide Low pH causing corrosion of metal components.
Foaming	Foam on surface of pool	Detergent soaps or shampoo in pool Excess algicide Excess water clarifier
High pH	pH above 7.6	Source water has high pH, Sanitiser has high pH Excess use of pH plus
Low pH	pH below 7.2	Source water has low pH, Sanitiser has low pH Excess use of pH minus
No apparent chlorine reading	Incorrect chlorine level	No chlorine Too much chlorine
Overstabilisation	Chlorine reading ok but green / cloudy pool	Excess cyanuric acid
pH bounce	Inability to maintain pH level	Low total alkalinity
pH resistant to movement	Inability to alter pH level	High total alkalinity
Scale	Calcium carbonate deposits	Unbalanced water

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Friction loss chart

Dia of pipe		32mm/25mm/1"				50mm/40mm/1.5"				63mm/50mm/2"				75mm/65mm/2.5"					
size in mm		ASTM(SCH40)		BS STD(Class3)		ASTM(SCH40)		BS STD(Class3)		ASTM(SCH40)		BS STD(Class3)		ASTM(SCH40)		BS STD(Class3)			
Avg. ID Pipe		26.70		29.50		41.00		46.40		52.50		58.50		61.80		69.50			
OD Avg.		33.40		32.00		48.26		50.00		60.32		63.00		73.02		75.00			
wall Min.		3.60		1.30		3.90		1.85		4.30		2.35		6.00		2.75			
wall Flow		3.38		1.20		3.68		1.70		3.91		2.20		5.61		2.60			
M3/hr LPM		Velocity (m/s)		M Loss		Velocity (m/s)		M Loss		Velocity (m/s)		M Loss		Velocity (m/s)		M Loss			
1.8	30	0.89	3.55	0.73	2.18	0.38	0.44	0.30	0.24										
2.1	35	1.04	4.72	0.85	2.90	0.44	0.59	0.35	0.32	0.27	0.18	0.22	0.10						
2.4	40	1.19	6.05	0.97	3.72	0.50	0.75	0.39	0.41	0.31	0.22	0.25	0.13	0.22	0.10	0.18	0.06		
2.7	45	1.34	7.52	1.09	4.63	0.57	0.93	0.44	0.51	0.35	0.28	0.28	0.17	0.25	0.13	0.20	0.07		
3.0	50	1.48	9.14	1.22	5.62	0.63	1.14	0.50	0.62	0.38	0.34	0.31	0.20	0.28	0.15	0.22	0.09		
3.3	55	1.63	10.90	1.34	6.71	0.69	1.35	0.54	0.74	0.42	0.40	0.34	0.24	0.30	0.18	0.24	0.10		
3.6	60	1.78	12.80	1.46	7.88	0.75	1.59	0.59	0.87	0.46	0.48	0.37	0.28	0.33	0.22	0.26	0.12		
3.9	65	1.93	14.85	1.58	9.14	0.82	1.84	0.64	1.01	0.50	0.55	0.40	0.33	0.36	0.25	0.29	0.14		
4.2	70	2.08	17.03	1.70	10.48	0.88	2.12	0.69	1.16	0.54	0.63	0.43	0.38	0.39	0.29	0.31	0.16		
4.8	80	2.38	21.80	1.95	13.42	1.01	2.71	0.79	1.48	0.62	0.81	0.50	0.48	0.44	0.37	0.35	0.21		
5.4	90	2.67	27.12	2.19	16.69	1.13	3.37	0.89	1.84	0.69	1.01	0.56	0.60	0.50	0.46	0.40	0.26		
6.0	100	2.97	32.96	2.44	20.29	1.25	4.09	0.99	2.24	0.77	1.22	0.62	0.73	0.55	0.56	0.44	0.31		
6.6	110	3.27	39.31	2.68	24.20	1.38	4.88	1.09	2.67	0.85	1.46	0.68	0.87	0.61	0.66	0.48	0.37		
7.2	120	3.57	46.18	2.92	28.43	1.51	5.74	1.19	3.14	0.92	1.71	0.75	1.02	0.67	0.78	0.53	0.44		
7.8	130					1.64	6.64	1.28	3.63	1.00	1.99	0.81	1.18	0.73	0.90	0.57	0.51		
8.4	140					1.76	7.62	1.38	4.17	1.08	2.28	0.87	1.35	0.78	1.03	0.61	0.58		
9.0	150					1.89	8.65	1.48	4.74	1.16	2.59	0.93	1.54	0.84	1.17	0.66	0.66		
9.6	160					2.01	9.75	1.57	5.34	1.23	2.92	0.99	1.73	0.89	1.32	0.70	0.75		
10.2	170					2.15	10.91	1.67	5.97	1.32	3.26	1.05	1.94	0.95	1.48	0.74	0.84		
10.8	180					2.27	12.13	1.77	6.64	1.39	3.63	1.11	2.16	1.00	1.65	0.79	0.93		
11.4	190					2.40	13.40	1.87	7.34	1.47	4.01	1.18	2.38	1.06	1.82	0.83	1.03		
12.0	200					2.52	14.74	1.97	8.07	1.54	4.41	1.24	2.62	1.11	2.00	0.88	1.13		
13.5	225					2.84	18.33	2.21	10.04	1.74	5.48	1.39	3.26	1.26	2.49	0.98	1.41		
15.0	250					3.15	22.37	2.46	12.2	1.93	6.69	1.55	3.96	1.39	3.03	1.10	1.71		
16.5	275							2.71	14.55	2.11	7.98	1.70	4.73	1.52	3.62	1.21	2.04		
18.0	300							2.95	17.09	2.30	9.37	1.86	5.53	1.66	4.25	1.32	2.38		
19.5	325									2.50	10.87	2.01	6.42	1.81	4.93	1.42	2.77		
21.0	350									2.69	12.46	2.17	7.36	1.94	5.65	1.54	3.17		
22.5	375									2.88	14.16	2.32	8.36	2.08	6.42	1.64	3.60		
24.0	400									3.07	15.96	2.48	9.42	2.22	7.24	1.76	4.06		
25.5	425									3.27	17.85	2.63	10.54	2.36	8.10	1.86	4.54		
27.0	450									3.46	19.84	2.79	11.72	2.50	9.00	1.98	5.05		
28.5	475									3.65	21.94	2.94	12.95	2.64	9.95	2.08	5.58		
30.0	500	Sea Green shaded area represents RECOMMENDED velocities lesser than 2M/S.										3.84	24.11	3.10	14.24	2.77	10.94	2.20	6.14
33.0	550															3.05	13.01	2.41	7.34
36.0	600	LIGHT YELLOW shaded area represents velocities over 2M/S. use with caution.														3.33	15.28	2.63	8.63
39.0	650															3.61	17.72	2.85	10.00
42.0	700															3.88	20.32	3.07	11.48
45.0	750															4.16	23.09	3.29	13.04
48.0	800															4.44	26.02	3.51	14.68
54.0	900																		
60.0	1000																		
72.0	1200																		
84.0	1400																		
96.0	1600																		
108.0	1800																		
120.0	2000																		
132.0	2200																		
144.0	2400																		
156.0	2600																		

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Friction loss chart

Dia of pipe		90mm/80mm/3"				110mm/100mm/4"				160mm/150mm/6"			
size in mm		ASTM(SCH40)		BS STD(Class3)		ASTM(SCH40)		BS STD(Class3)		ASTM(SCH40)		BS STD(Class3)	
Avg. ID Pipe		77.90		83.50		102.30		102.20		154.50		147.50	
OD Avg.		88.90		90.00		114.30		110.00		168.28		160.00	
wall Min.		6.00		3.25		6.50		3.90		7.70		6.45	
wall Flow		5.49		3.10		6.02		3.70		7.11		6.20	
M3/hr LPM		Velocity {m/s}	M Loss	Velocity {m/s}	M Loss	Velocity {m/s}	M Loss	Velocity {m/s}	M Loss	Velocity {m/s}	M Loss	Velocity {m/s}	M Loss
1.8	30												
2.1	35												
2.4	40												
2.7	45												
3.0	50												
3.3	55	0.19	0.06	0.17	0.04								
3.6	60	0.21	0.07	0.19	0.05								
3.9	65	0.23	0.08	0.20	0.06								
4.2	70	0.24	0.09	0.22	0.07								
4.8	80	0.28	0.12	0.25	0.09	0.16	0.03	0.16	0.03				
5.4	90	0.31	0.15	0.28	0.11	0.18	0.04	0.18	0.04				
6.0	100	0.35	0.18	0.31	0.13	0.20	0.05	0.20	0.05				
6.6	110	0.38	0.21	0.34	0.15	0.22	0.06	0.22	0.06				
7.2	120	0.42	0.25	0.37	0.18	0.24	0.07	0.24	0.07				
7.8	130	0.46	0.29	0.40	0.21	0.26	0.08	0.26	0.08				
8.4	140	0.49	0.34	0.43	0.24	0.28	0.09	0.28	0.09				
9.0	150	0.53	0.38	0.46	0.27	0.30	0.10	0.31	0.10				
9.6	160	0.56	0.43	0.49	0.31	0.32	0.11	0.32	0.11	0.14	0.02	0.15	0.01
10.2	170	0.60	0.48	0.52	0.34	0.35	0.13	0.34	0.12	0.15	0.02	0.16	0.02
10.8	180	0.63	0.53	0.55	0.38	0.37	0.14	0.36	0.14	0.16	0.02	0.17	0.02
11.4	190	0.67	0.59	0.59	0.42	0.39	0.16	0.39	0.15	0.17	0.02	0.18	0.02
12.0	200	0.70	0.65	0.62	0.46	0.41	0.17	0.41	0.17	0.18	0.02	0.19	0.02
13.5	225	0.79	0.81	0.69	0.58	0.46	0.21	0.46	0.21	0.20	0.03	0.22	0.03
15.0	250	0.88	0.98	0.77	0.70	0.51	0.26	0.51	0.25	0.22	0.04	0.24	0.03
16.5	275	0.96	1.17	0.85	0.83	0.56	0.31	0.56	0.30	0.24	0.04	0.27	0.04
18.0	300	1.04	1.38	0.93	0.98	0.61	0.37	0.61	0.35	0.27	0.05	0.29	0.05
19.5	325	1.14	1.60	1.00	1.13	0.66	0.42	0.66	0.41	0.29	0.06	0.32	0.05
21.0	350	1.22	1.83	1.08	1.30	0.71	0.49	0.71	0.47	0.31	0.07	0.34	0.06
22.5	375	1.31	2.08	1.16	1.48	0.76	0.55	0.76	0.53	0.33	0.08	0.36	0.07
24.0	400	1.39	2.35	1.23	1.66	0.81	0.62	0.81	0.60	0.36	0.09	0.39	0.08
25.5	425	1.49	2.63	1.31	1.86	0.86	0.70	0.86	0.67	0.38	0.10	0.41	0.09
27.0	450	1.57	2.92	1.39	2.07	0.91	0.78	0.91	0.75	0.40	0.11	0.44	0.10
28.5	475	1.66	3.23	1.46	2.29	0.96	0.86	0.96	0.83	0.42	0.12	0.46	0.11
30.0	500	1.74	3.55	1.54	2.51	1.01	0.94	1.02	0.91	0.45	0.13	0.49	0.12
33.0	550	1.92	4.22	1.69	3.01	1.11	1.12	1.11	1.09	0.49	0.15	0.53	0.14
36.0	600	2.09	4.96	1.85	3.53	1.21	1.32	1.22	1.28	0.54	0.18	0.58	0.17
39.0	650	2.27	5.75	2.00	4.10	1.32	1.53	1.32	1.48	0.58	0.21	0.63	0.20
42.0	700	2.44	6.59	2.16	4.70	1.42	1.75	1.42	1.70	0.62	0.24	0.68	0.23
45.0	750	2.62	7.49	2.31	5.34	1.52	1.99	1.52	1.94	0.67	0.27	0.73	0.26
48.0	800	2.79	8.44	2.47	6.01	1.62	2.24	1.62	2.18	0.71	0.31	0.78	0.29
54.0	900	3.14	10.49	2.73	7.48	1.82	2.79	1.80	2.71	0.80	0.38	0.86	0.36
60.0	1000	3.49	12.74	3.04	9.09	2.02	3.38	2.00	3.29	0.89	0.46	0.96	0.44
72.0	1200	4.19	17.86	3.65	12.74	2.43	4.74	2.40	4.62	1.07	0.65	1.15	0.61
84.0	1400			4.26	16.94	2.84	6.30	2.80	6.14	1.25	0.86	1.34	0.82
96.0	1600					3.24	8.07	3.25	8.11	1.43	1.10	1.56	1.08
108.0	1800					3.64	10.04	3.65	10.69	1.60	1.37	1.75	1.42
120.0	2000									1.78	1.66	1.95	2.05
132.0	2200									1.96	1.98	2.14	2.45
144.0	2400									2.14	2.33	2.34	2.88
156.0	2600									2.32	2.70	2.53	3.34