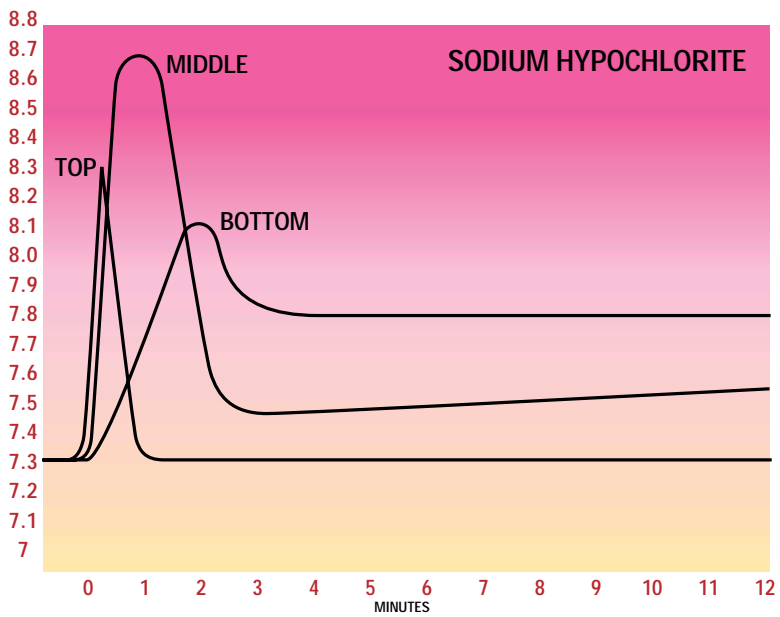
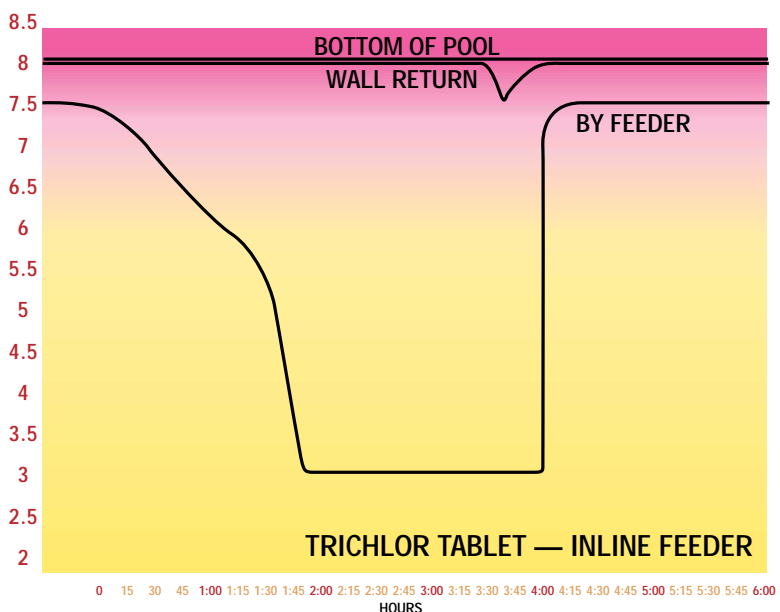
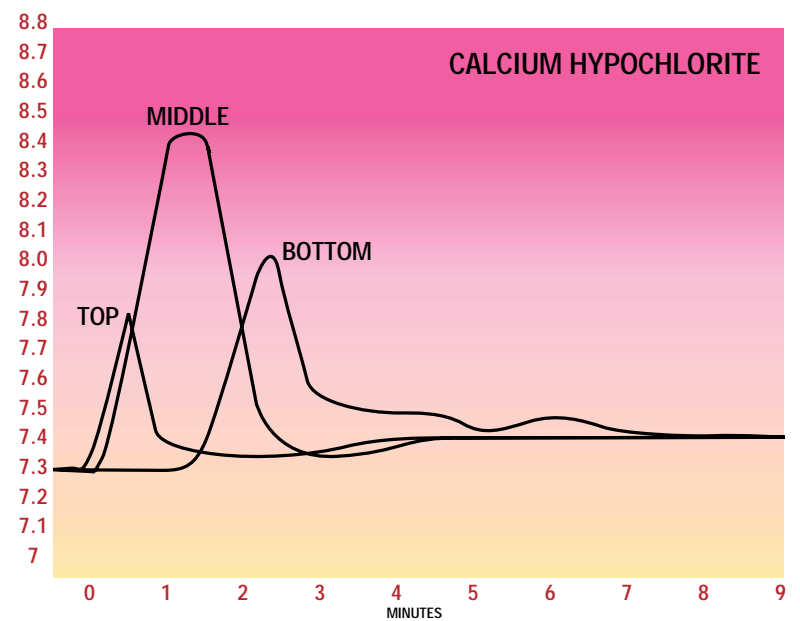


pH DYNAMICS OF CHLORINATION

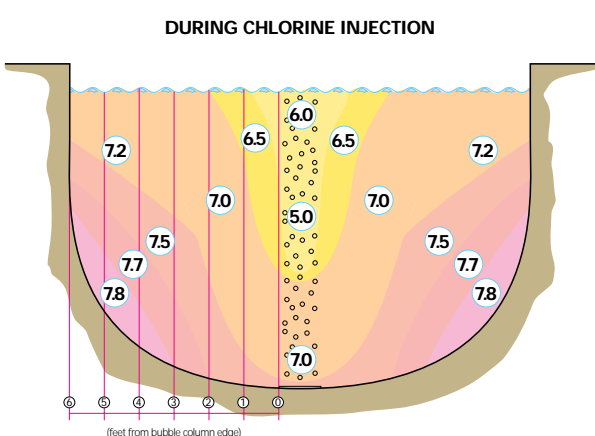
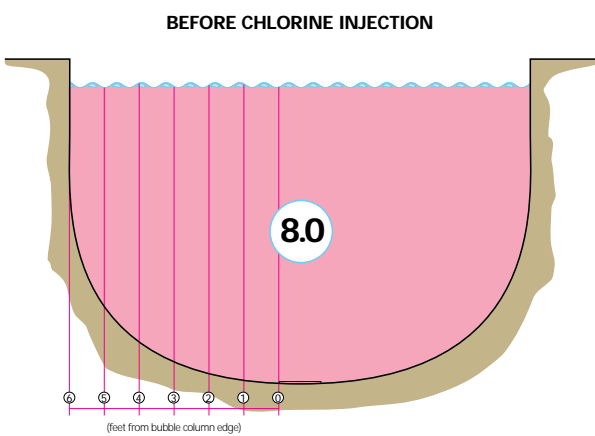


SODIUM HYPOCHLORITE – For this profile, the top pH probe was placed 6 inches below the water surface, the middle probe was placed 3 feet below water surface, and the bottom probe was placed 6 inches from the bottom of the pool. With the circulation system running, 1 gallon of sodium hypochlorite was poured over the top probe. The graph reflects both the amount of time required for the chemical to affect the pH of the water (see the difference between the top and middle pH levels), as well as the widening area of coverage as the material descended to the bottom of the pool (see the difference between the middle and bottom pH levels). The circulation system carried the liquid around the pool, lessening its pH impact. A stratification of the pH in the pool lasted 30 to 35 minutes before blending was complete.

CALCIUM HYPOCHLORITE – For this profile, the top pH probe was placed 6 inches below the water surface, the middle probe was placed 3 feet below water surface, and the bottom probe was placed 6 inches from the bottom of the pool. With the circulation system running, 2 pounds of calcium hypochlorite was broadcast over the top probe. The graph reflects both the amount of time required for the chemical to dissolve and affect the pH of the water (see the difference between the top and middle pH levels), as well as the widening area of coverage as the material descended to the bottom of the pool (see the difference between the middle and bottom pH levels). The circulation system carried the powder around the pool, encouraging dissolution of the solid material and lessening its pH impact. All three probes showed a leveled-off pH 7 to 8 minutes after the addition of the chlorine.



TRICHLOR TABLETS – For this profile, the first pH probe was placed on the bottom of the pool, the middle probe was placed over the wall outlet to the pool, and the bottom probe was placed 4" downstream from the chlorinator. A backflow preventer was installed between the chlorinator and the filter, and a PVC loop was installed downstream from the chlorinator to prevent seepage down the wall of the pool when the system was off. With the circulation system running, the bottom of the pool was unaffected, the wall outlet showed a .2 pH reduction, and the probe 4" past the chlorinator showed a .7 pH reduction. When the system was turned off, the pH by the chlorinator dropped to pH 3.2 within 2 minutes, and remained there until the system was turned on again. When the system started back up, the chlorinator probe jumped back to -0.7 of the overall pH within 15 seconds, and the wall return was affected by the passage of the acidic solution for about a 15 second period, dropping approximately .7 of a pH unit.



GAS CHLORINE – Unlike the mixing action of solid or liquid chemicals, which tend to sink to the bottom and then mix upward, gas injection primarily affects the center and surface of the pool - which is logical since gas bubbles rise rather than sink in pool water. Also, gas injection differs in that the diffusion method physically moves the water, resulting in the blending of the chlorine, as opposed to the solid, powder, and liquid compounds of chlorine which are circulation dependent for dissolution and blending. The testing for gas chlorine consisted of injecting two pounds of chlorine. The pH probes were initially placed vertically above the gas injector: one six inches above the point of injection, the second six inches below water surface directly above the first probe, and the third midway between the first two. The probes remained in the pool for 24 hours after injection. In subsequent tests the probes were moved one foot to the side of the point of injection, then two feet, three feet, and so on until finally tests were done with the probes resting against the pool wall. Follow-up testing was conducted with the probes in the shallow end, under the injector, and in the skimmer. The accompanying diagrams result from the "mapping out" of the process. The actual two pound chlorine injection lasted four minutes, releasing chlorine at a rate of ½ pound per minute. During the injection, the pH immediately above the injection point drops relatively little. Within a few feet, the pH reaches its lowest level, as the chlorine and water reaction generates HOCl (free active chlorine) and HCl (hydrochloric acid). By the time the flow reaches the surface, blending has already begun, due to the venturi-like flow of water created by the gas flow, diluting the acid and allowing the pH to rise. As the water flows across the surface and then back down, the distribution and the dilution of the chlorine and acid continues. Immediately after the injection is stopped, the pH "jumps" to the 7.0+ levels. In this particular method of application the time required for full blending was under 30 minutes.

