

1. Drain the spa completely and remove the vinyl or sheet plastic installed in the fall at the bottom. Clean the surfaces of the spa shell as needed.
2. Remove all plugs and reinstall any fittings. Replace the skimmer basket and weir.
3. Reinstall the pump/motor, air blowers and heater. Make sure any ground wires are properly reconnected.
4. Refill the spa and start the filtering system. Change the DE in the filter if needed. Check and balance the water chemistry. Add sanitizer.
5. Start the heater and check for proper operation. Leave heat on and set the thermostat to a low setting.

CHEMICAL WASHING AND ETCHING

Concrete pools and spas with plaster interior finishes require, at some point a thorough cleaning for stain-removal. For painting, repainting or replastering, pool/spa surfaces need to be chemically prepared.

Acid washing treats the pool surface with an acid solution to remove stains, not the surface itself. Acid washing should not etch the surface. It is strictly a cleaning procedure.

Acid etching is a procedure to prepare the surface for painting or replastering. Acid etching treats the surface with a stronger acid solution, so that the surface itself is slightly etched.

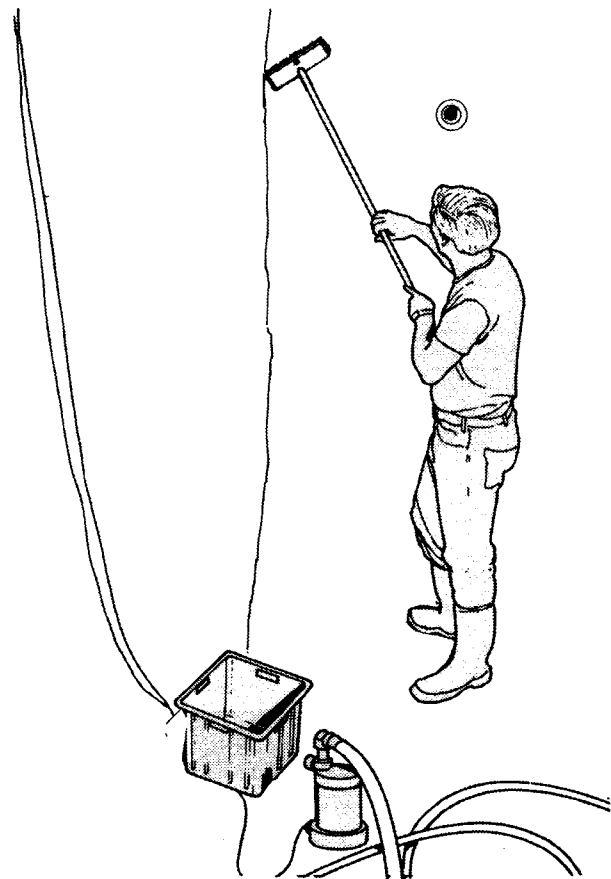
The procedures for acid washing and acid etching are about the same. The main difference is that the acid solution used in acid etching is much stronger.

When preparing a bare masonry surface for painting, acid-etch all surfaces until they have a uniform granular texture. Re-etch smooth, powdery or slick spots. The entire bare masonry surface of a swimming pool *must* have the texture of fine- to medium-grade sandpaper for paints to maintain a long-lasting bond.

This section explains the special precautions for handling acid, draining a pool and acid washing or etching. Also included in this section is information on chlorine washing and hydrogen peroxide washing.

NOTE: Oxalic acid should not be used to acid-wash pools since it may be lethal in concentrations as little as 50 ppm. Any product containing this material should be banned in and around swimming pools.

See *Unit 2* for basic information about plaster finishes and when acid washing is required. Before draining a pool or spa, it is important first to be familiar with the information in *Unit 2*, especially the section on pool flotation due to hydrostatic pressure.



**Figure 10-13 Acid Washing & Etching
Acid Handling**

You should handle acid safely for your own personal protection and to ensure that there is no damage to your customer's property. Please follow the general safety guidelines for chemical handling contained in this manual.

Acid should be carried in a sealed container from the truck to the pool. Always open the acid container over the pool. This will prevent any acid splashing on grass, concrete, decking, coping or other areas. Acid can disfigure, discolor, destroy or burn many surfaces, including metal, skin and clothes.

Personal Protection and Environmental Precautions

- *Always wear full protective gear* when working with acid, including gas mask respirator with appropriate filters, rubber gloves, rubber boots, suit and goggles. Fumes can be noxious and a gas mask is advised.
- *Never work alone.*
- When working on indoor pools, be sure you have adequate ventilation.
- Follow all safety guidelines and precautions for working with acids.
- And remember, **ALWAYS ADD ACID TO WATER, NEVER WATER TO ACID.** Adding water to acid causes a reaction (explosion) that will throw the acid out of the container, and possibly onto you.

As with all acids, avoid skin or eye contact. Immediately flush area with fresh water if there is contact. If you spill acid on your body or clothing, it will burn. Immediately wash the area with large amounts of water. Acids will be harmful to the skin if they remain in contact with the skin for more than 10 to 15 minutes. Always keep acids away from children.

Wastewater and the diluted by-products from the acid washing can also kill organic matter. Keep water running at all times in the pool so that the acid at the bottom of the pool is immediately *diluted* by large quantities of water. In accordance with the NSPI Information Bulletins (located in the Appendix of this book) acid wash water should be *neutralized*, with soda ash, to a pH of approximately 7.0 prior to disposal. The neutralization can be accomplished in the pool or in a holding tank. This diluted and neutralized solution should be pumped to a proper disposal area. Disposal should be made in compliance with Federal, state and local municipal wastewater codes.

Draining the Pool/Spa

Before draining any inground pool or spa, you should be thoroughly knowledgeable about pool flotation due to hydrostatic pressure (see *Unit 2*). Hydrostatic pressure is a subject of extreme importance to pool service technicians. Excessive hydrostatic pressure severely damages or destroys many concrete pools each season. When a pool is emptied for acid washing, painting, replastering or other work and then left for a period of time, the existing underground water pressure or water soaked soil presses so hard upon the empty shell that it literally floats out of the ground. Obviously, extensive damage is usually done to the pool structure itself, not to mention to the circulation lines, decks, etc.

A separate pump that is not part of the circulation system should be used to drain residential pools. Carefully monitor the discharge water to make sure that lawns and shrubs are protected. Also check to make sure you're not flooding neighboring property, and that the water is drained far enough away from the pool to avoid any washouts or hydrostatic problems.

Remove all winterizing plugs and make sure the skimmers and return lines are drained. Once the water level is low enough to wade into the deep end, re-

move all hydrostatic relief valves or plugs. *NOTE: If a relief plug becomes visible in the shallow end of the pool floor as the water level is falling, open that plug immediately as well.*

If the pool will be empty and the hydrostatic plugs cannot be readily opened, you should force them open. This is very important when acid washing a pool or whenever a pool stands empty. If there is a high water table under the pool and too much water is removed, the pool may pop out of the ground at any time. The water table equalizes itself by forcing groundwater in through the pressure relief plugs open in the pool.

Once lowering of the pool water commences and the shallow end is visible, start the procedures for acid washing or acid etching.

Performing the Acid Wash/Etch

Preparation

Always wear full protective gear when working with acid, including gas mask respirator, rubber gloves, rubber boots, suit, goggles. Fumes can be noxious and use of a gas mask is advised. Never work alone. When working on indoor pools, be sure you have adequate ventilation. Follow all safety guidelines and precautions for working with acid. And remember, *always add acid to water. Never add water to acid or an explosion may result.* Avoid skin or eye contact. Immediately flush area with fresh water in the event of such contact. Use plastic or wooden utensils for mixing. Keep acid solution away from metal. All metal pool equipment should be removed wherever possible. Immediately rinse with large amounts of water any metal fixtures that come in contact with acid solution to prevent corrosion. Always keep a hose of water running throughout the acid washing/etching procedure.

Mix and store the acid in the pool to avoid damage to pool decks, coping and landscaping. All tools and equipment should also be brought down into the pool initially to avoid needless tracking of acid solution outside the pool.

Mixing the Acid Solution

Muriatic acid (MA), which is a diluted form of hydrochloric acid, is normally used when acid washing or acid etching a pool. Generally, muriatic acid is packaged at a strength of 20 to 30 percent and must be further diluted by the technician. *NOTE: Do not purchase muriatic acid if strength is not marked on the container. Such material may be "re-claimed" acid of indeterminate strength.*

For *acid washing* you will generally need a weaker muriatic acid wash solution (3-4% MA) up to a very strong acid wash solution (10%). The stronger solution may etch away a small amount of plaster. Mix one or two trial batches to test which strength of solution is best for your needs.

MIXING MURIATIC ACID (MA) SOLUTION	
3-4% ACID WASH MIXTURE (WEAKER):	
Example 1:	1 gal. 20% MA + 4 gal. water = 5 gal. 4% solution
Example 2:	1 gal. 30% MA + 8 gal. water = 9 gal. 3.3% solution
10% ACID WASH OR ETCH MIXTURE (STRONGER)	
Example 1:	1 gal. 20% MA + 1 gal. water = 2 gal. 10% solution
Example 2:	1 gal. 30% MA + 2 gal. water = 3 gal. 10% solution

Figure 10-14 Acid Washing Table

For *acid etching* you will generally need to use a 10 percent up to a 20 percent solution. Specific situations - treating a painted pool, a rough masonry finish, an extremely smooth or dense masonry finish - may require different acid strengths. You should adjust the muriatic acid strength up or down, as the situation warrants.

If you need to use a 20 percent solution, you should buy that strength and use it right from the container. Weaker solutions will have to be mixed on site. Water-to-acid proportions are shown in the accompanying chart. *Always add acid to water. Never add water to acid or an explosion may result.*

Applying the Acid Solution

Before you begin to apply the acid solution, you should be dressed in proper gear and have all needed equipment in the pool, including the mixed acid washing/etching solution.

Take all precautions during the application procedure. To prevent splash back, avoid swabbing around or scrubbing the acid solution or foamy acid residue. Do not apply acid solution to the entire pool at once. Always work one section at a time.

Starting with the first section, apply the appropriate acid solution liberally to the surface with a plastic garden sprinkling can or plastic sprayer. Scrub badly stained areas with a non-metal brush. When foaming has ceased or the section is adequately cleaned, hose-rinse the section thoroughly with fresh water. Repeat the hose-rinse on the same section while simultaneously scrubbing with a stiff brush to completely remove any neutralized acid residue.

Don't let any acid dry on the pool surface. Dried-on residue is a common cause of paint failure. Finish the entire procedure on each section before proceeding to the next. Marbleite or plaster-finished pools sometimes require additional applications to remove stub-

born stains. However, not all stains can be removed. Be careful not to over-apply acid to such stains and cause damage to the plaster finish.

Next, wash the pool shell with a solution of soda ash in water, to neutralize any active acid residue on pool surfaces. This also assists in raising the pH of the wastewater in the shell to a level acceptable by EPA standards (pH between 6.0 and 8.0). Follow with a copious fresh-water rinse of all surfaces.

If the pool is to be filled following *acid washing*, you should start filling it immediately. Careful placement of the fill water hose is important. You do not want the fill water to run over the pool surface because its minerals may stain the pool surface. Place the hose nozzle in the pool of water forming at the bottom (deep end).

After an acid etch, if the pool is to be painted, please refer to the paint manufacturer's recommendations for surface preparation. Paints and procedures are discussed in *Unit 2*.

After completing acid washing or acid etching, flush all pumps with clean water to prevent deterioration.

Disposing of Wastewater

Test wastewater residual in the pool to determine its pH level. If pH is 2.0 or below, remove the solution to plastic drums and dispose of them properly in a hazardous waste facility.

If pH is less than 5.4, add proper amount of soda ash to raise the pH to the acceptable level (pH = 6.0-8.0). Soda ash addition should be done slowly since the release of carbon dioxide (CO₂) bubbles will occur. Dispose of the wastewater solution in the manner prescribed by the EPA or local environmental jurisdictions, whichever is the more stringent. If pH is above 12.5, add proper amount of muriatic acid (HCl) or other acid to lower the pH to the accept-

able level (pH = 6.0 - 8.0).

Other Chemical Washing (Chlorine)

In addition to the traditional method of acid washing described above, the following methods have been used: chlorine, hydrogen peroxide and ascorbic acid.

CAUTION: In all cases, be sure to take proper precautions for safety. This includes using proper clothing, ventilator if needed and disposing of wastewater according to all local and federal regulations.

You must take special precautions. *DO NOT MIX CHEMICALS for chlorine washing with chemicals for acid washing. EXPLOSION AND DANGEROUS GASES COULD RESULT. Be sure there is no mixing of chemicals in the pool/spa or in any pumps, containers or tools used. Use separate equipment. Be sure there is no trace of chemical residue from the acid wash in the pool or spa.* If your customer also has a serious problem with algae, you might want to consider performing a chlorine washing after the acid wash. When you rinse the pool thoroughly with liquid chlorine, algae will be killed. Chlorine washes are also used to brighten up dingy plaster. Hydrogen peroxide is used to brighten up and clean stains, especially on pools using polymeric biguanide sanitizer. The ascorbic acid wash is often used to remove metal stains.

Follow these steps when conducting a chlorine wash.

1. Rinse the pool surface thoroughly with water.
2. Pump excess water out of the pool.
3. Use same procedure as acid, but substitute chlorine.
4. Saturate the entire surface with chlorine, using the pump to move the chlorine through the vacuum hose.
5. Depending on the type of algae, you might want to use a brush to scrub the surface. Black algae in particular should be "wounded" with a stain-

less steel wire brush.

6. You can leave the chlorine at the bottom, as it will be useful in sanitizing the fresh water.
7. Fill the pool with fresh water. Test water chemistry and balance accordingly.

For hydrogen peroxide and ascorbic acid washing, use same procedure as chlorine wash.

NOTES TO CHAPTER 10-2:

Figure 10-15 Swimming Pool Opening Record Form