



GUIDE TO ACID ETCHING CONCRETE

The Acid Etching procedures required to produce a concrete surface suitable to accept and hold a coating system are outlined below. **CAUTION:** Acid etching requires a strong acid capable of inflicting severe injury. When handling acid, wear protective clothing, rubber gloves, boots, and splash goggles or face shield. Avoid breathing acid vapors. **Never** add water to acid when diluting; **always** add acid to water. **Mask** off and protect all surfaces not intended to be acid treated that might be affected by inadvertent splashes or spills. Dispose of leftover acid in an approved manner according to local regulations.

PROCEDURE OUTLINE:

1. Clean concrete surface.
2. Prepare acid solution.
3. Dampen concrete surface.
4. Apply acid solution uniformly. Scrub it in.
5. Allow acid time to react—usually 2-10 minutes.
6. Rinse surface with clean water.
7. Neutralize surface { Ammonia scrub preferred } 1/4cup-1gal
8. Dry surface thoroughly before coating.

For best performance from a coating system, concrete must be clean and have a uniformly porous surface prior to painting. Failure to achieve this condition will likely result in poor appearance and/or premature failure of the coating system.

1.) GENERAL PREPARATION REQUIREMENTS: Remove dirt, oils, grease, wax, release agents, dust, paint removers or other contaminants on the concrete surface by appropriate methods such as broom cleaning, vacuum cleaning, air blast cleaning, water cleaning, detergent wash cleaning or steam cleaning (see ASTM Test Method D 4258-83: Standard Practice for Surface Cleaning Concrete for Coating). Deeply embedded contaminants such as grease, oils, form release agents, curing agents and sealers require deeper cleaning methods for removal such as Porter Prep Heavy Duty Cleaner No. 571. Brush scrubbing, either by hand or machine, will be required for the cleaners to work properly. Some contaminants such as sealers and curing agents may not be removable by cleaning and will require removal of the surface layer by mechanical means as an alternate to acid etching (see Porter Paints Technical Bulletin #13: PORTER SURFACE PREPARATION: CONCRETE).

New Concrete: New concrete should be aged 30 days minimum and moisture content must be below 12% prior to coating (in the absence of a suitable moisture meter, follow ASTM Test Method D 4263-83: Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method). Remove any surface imperfections such as fins or other surface protrusions by mechanical means, and fill bug holes and other voids with a suitable filler such as Bondex Concrete Patch.

Previously Painted Concrete: Clean as outlined in the General Preparation Requirements section. Remove loose or failing paint by scraping, sanding, wire brushing, power washing, etc. Feather edges by sanding as necessary. If exposed concrete areas are small, thoroughly wire brush to remove laitance, efflorescence or another contamination and to open the surface for priming. If exposed

concrete areas are large, treat the surface as unpainted concrete and acid etch as outlined below. Widespread adhesion failure may indicate a need to remove the remaining coating by sweep blasting, power washing, power tooling, paint remover, or other appropriate means so that the concrete can be properly prepared to hold a coating system. If coating failure has been caused by water intrusion, the cause must be corrected before repainting. Prepare remaining sound coatings for repaint as appropriate.

2.) PREPARE ACID ETCHING SOLUTION: Although a variety of acids such as muriatic, sulfamic, phosphoric or citric can be used to etch concrete, the most commonly used are **muriatic** (hydrochloric) and phosphoric acids. (**Note:** use muriatic acid only where chlorides are permitted.) Use only plastic or other acid resistant containers for mixing and spreading acid. Because the concentration of commercial containers of acid may vary, it is necessary to calculate the amount of dilution with water required to reach typical levels of concentration for etching concrete: muriatic acid (usually 1 part acid added to 3 parts water) or phosphoric acid (up to 1 part acid added to 1 part water). Because the acid concentration required can vary, a good method for determining required acid concentration is to test with a very dilute solution, then add acid to the container until a strong bubbling action is noted in the test. This will establish the amount of acid concentration required. Allow one gallon of the mixture for each 50-75 sq. ft. of rough concrete or each 75-100 sq. ft. of smooth concrete. **UNLESS preparing for a Patina concrete stain, in that case, 30-1 ratio is usually acceptable, 20-1 if hard troweled. It is always recommended to do a mock up area, or test patch w/ color to test for receptivity and retention. We do Not want to remove all of the cement paste as this is a conductor for the stain**

3.) DAMPEN THE CONCRETE: (Note: lay out the project into small enough sections so that the area being worked can be completed without drying out.) Pre-wet the concrete surface with clean, potable water so that the concrete is uniformly wet without any standing or puddling water. The concrete must remain wet until the acid solution is applied.

4.) APPLY THE ACID SOLUTION: Apply the acid solution **uniformly** over the surface of the concrete. A plastic garden sprinkler can is an excellent means of application. For the etching

result to be uniform, it is important that fresh acid be deposited in a consistent and uniform manner over the entire surface. (Do not dump a pail of acid solution on a floor and then sweep the liquid to spread it—the acid pushed to the outer areas will be partially spent and will not yield a uniform result.) The liquid will begin bubbling indicating the acid is reacting with the surface layer of concrete. (If any areas fail to produce this bubbling action, it means the area has contaminants that are preventing the acid from reaching the concrete. These areas will have to be properly cleaned and re-etched or be prepared by mechanical methods such as hand or power tooling.) During the application process, scrub the acid solution thoroughly into the concrete with a stiff bristle brush. **5.) ALLOW ACID TIME TO REACT:** Allow the acid solution to remain on the concrete as long as the bubbling continues (normally 2-10 minutes depending on acid concentration and floor conditions). Do not allow any areas of the treated floor to dry out during this process.

6.) RINSE THE CONCRETE: When the bubbling slows noticeably, either flush the floor thoroughly with plenty of water or first spray the surface with a solution of one pound of sodium carbonate (soda ash) in five gallons of water to neutralize the remaining acid and then flush the floor with water. If no drains are present, use wet vacs to pick up all the liquids for proper disposal. **If the concrete is not uniformly etched to a texture of medium grit sandpaper, repeat the acid etching process.** Flush the surface at least two or three times, preferably while scrubbing with a stiff bristle broom to work as much of the powdery residue out of the pores as possible. After the concrete is dry and before painting, any residue or powder that remains in the pores of the concrete must be vacuumed out to avoid possible adhesion failure. **7.) NEUTRALIZE THE**

CONCRETE IF NECESSARY: After the final intended rinse, check the pH of the rinse water on the still wet concrete surface with pH paper (see ASTM Method D 4262-83: Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces). Ideal pH is 7.0 (neutral), but a pH range of 6.0-9.0 is acceptable for most coatings (unless otherwise specified). If the pH is below 6.0, residual acid remains in the concrete pores and must be neutralized. A neutralizing solution of two pounds of sodium carbonate (soda ash) in five gallons of water or a strong ammonia solution will usually neutralize the concrete in one application. Spread the neutralizing solution uniformly over the concrete in the manner that was done with the etching acid. **Keep the surface wet** with the solution for ten minutes before flushing with agitation as was done with the etching solution. Re-check the pH and repeat the neutralizing process if pH of the rinse water is still below 6.0. If pH is over 9.0, repeat the rinsing process until pH is in the acceptable range. **8.) DRY THE CONCRETE**

THOROUGHLY BEFORE PAINTING: Regardless of the coating system selected, it is necessary to dry the concrete to a low enough moisture content that residual moisture will not affect the application, cure or performance of the coatings. Ideally, moisture content will be below 12% for most coatings or below 15% for acrylic paints. In the absence of a suitable moisture meter, follow ASTM Test Method D 4263-83: Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method by taping sheets of

mil thick polyethylene plastic, at least 18 by 18 inches square, onto the concrete with 2-inch wide duct tape. Do at least one test patch for each 500 square feet of concrete. Allow the test patches to remain in place at least 16 hours before removing the plastic to check for moisture on the back of the plastic and on the test area of the concrete surface. Although this method does not quantify the moisture content, it is possible to ascertain the relative amount of free moisture and whether or not to delay coatings application. Drying of the concrete can be accelerated by blowing warm, dry air over the surface. Fans alone will speed drying tremendously. **9.) APPLY THE COATING SYSTEM:** TIP: Be sure that the prime coat is very fluid, usually accomplished by thinning the primer 20-25% (or more, if specified) with designated thinner, so that the coating will reach deep into the pores of the concrete and establish a strong mechanical bond. This is the anchor for the coating system and determines the long-term adhesion of the coating system. Allow extra time for the deeply penetrated solvents to escape from the concrete before over coating the primer.

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