# AquataPoxy
## Application Design Guide

Cohesant Materials manufactures the AquataPoxy line of solvent-free epoxy coatings and grouts ("AquataPoxy"). These unique high-build epoxy products can be applied to steel, fiberglass, masonry or concrete surfaces where exposure to corrosive and erosive environments could be expected. The thixotropic characteristics of AquataPoxy allow them to be sprayed, squeegeed, or rolled on horizontal, vertical or overhead surfaces providing an impermeable corrosion resistant topping when properly applied.

Some AquataPoxy products are extraordinarily moisture tolerant. Most systems are self-priming. Different versions allow single coat application thicknesses varying from 8 to 250+ mils.

Although dry substrates are always preferable for any coating, most products will bond very well under damp and adverse conditions. Because most AquataPoxy products have the ability to cure underwater, in certain situations, they can be exposed to liquids prior to full cure or can even be applied underwater (see underwater specs).

This guide provides information regarding the work, materials and equipment required for protection and rehabilitation for the purpose of eliminating infiltration, providing corrosion protection, repair of voids and enhancement or restoration of the structural integrity of the surface by application of a monolithic fiber-reinforced high-build epoxy to the surfaces.

### Section 1: SURFACE PREPARATION

Proper surface preparation is essential to ensure maximum and proper adhesion; the purpose being to provide a clean, sound substrate with adequate profile and surface porosity to provide a strong bond between the coating and the substrate.

Mechanical abrasion is preferable whenever practical. Generally, rust, latent concrete and other surface contaminants can be removed by high pressure water cleaning, acid etching, abrasive blasting, shot blasting, hand tooling or some combination thereof. For small and hard to reach places, hand grinders and wire brushing may be required. If mechanical cleaning is not practical, or oil and grease have had an opportunity to penetrate deep into the substrate, it may be necessary to remove and replace or chemically clean the surface. Some typical surface preparation procedures for various substrates include:

**CONCRETE AND MASONRY**

Standard new concrete (not quick setting, high strength concrete) should be completely cured (10-28 days based upon concrete manufacturer's recommendations and surface tensile strength), clean, dust and contaminant free. Existing concrete must be structurally sound and free of all contaminants. Existing incompatible or poorly bonded coatings, form release, curing compounds, toppings, waxes, oils, greases, etc. must be removed prior to application.

The surface to be coated shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the epoxy coating and the substrate. Generally, this can be accomplished with high pressure water cleaning using equipment capable of 5,000 psi at 4 gpm. Mechanical methods such as high pressure water jetting (refer to NACE Standard No. 5/SSPC-SP12), abrasive blasting, shotblasting, grinding or scarifying may be used to remove previous coatings, laitance and contaminated, disintegrated or chalky material. Detergent water cleaning and hot water blasting may be necessary to remove oils and grease from the concrete. Chemical cleaning, such as acid etching with muriatic acid, can be used in select situations. Care must be taken to remove all residual acid prior to the application of any coating. Whichever method(s) are used, they should be performed in a safe manner that provides a uniform, sound, clean surface that is not excessively damaged.

**STEEL**

Steel structures being coated to protect against incidental exposure or splash should be prepared as follows:

Remove all scale, deposits and soluble salts, round off all rough weld and sharp edges. Remove any weld splatter. Dry-abrasive blast according to Steel Structures Painting Council Specification SP-10. Use

only steel grit (G-40 size), steel shot (S-230 size), graded flint, black beauty or equal (30-60 mesh). If reusing abrasives, clean them of contamination before reusing. Do not reuse sand or flint abrasives.

Surfaces should have a 2 mil minimum profile. Use air with minimum of 200 CFM per blast nozzle at minimum of 100 psi. Vacuum sweep surfaces to remove all dust. Apply the coating as soon as possible to prevent blasted surfaces from rusting. Keep moisture, oil, grease, soluble salts or other organic matter off the surface before coating. Spot reblast and vacuum to remove any contamination.

Steel structures being coated to protect in severe-duty immersion services should be prepared in the same manner as above except blasting may be recommended inaccordance to SSPC Specification SP-5 to "white metal".

## Section 2: REPAIR AND PATCHING

Repairs and patching necessary for final surface preparation varies from structure to structure. Typical summary procedures:

**CONCRETE AND MASONRY**

1. Areas exhibiting movement or cracking due to expansion and contraction shall be grouted and patched according to the appropriate crack repair or expansion joint procedure provided by the manufacturer. If excessive movement is still occuring, use an expansion joint material and procedure.

2. Surfaces exhibiting exposed structural steel, spalling greater than 3/4 inches deep or cracks greater than 3/8 inches wide, shall be patched using a quick setting, high strength cement mortar or a high-build, non-sagging epoxy grout after sandblasting steel to SSPC-10. Holes to be filled should be done so in lifts according to manufacturer's recommendations.

3. Concrete that is not sound or has been damaged by chemical exposure should be removed to a sound concrete surface.

4. Where reinforcing steel is missing and radial cracking from the spall site exists, the steel shall be replaced unless the project engineer determines that calculations of a new moment of inertia and maximum allowable moment indicate that the replacement product will offset the loss of steel.

5. Where loss of mortar has created gaps greater than 1/4 inch in diameter between the bricks or blocks, the voids can generally be filled using a compatible quick setting cementitious mortar. Whenever structural integrity is questioned, a high-strength cement mortar or epoxy grout should be utilized. Void filling before coating will also greatly assist in mitigating outgassing which can cause pinholing in topcoats.

6. Underground structure surfaces shall be free of active leaks before coating. Leaks may be stopped with the use of approved quick setting hydraulic cement, water reactive gels and grouts, epoxy grout or equal.

**STEEL**

Surfaces shall be thoroughly inspected, and when suspect, ultrasonically tested to detect thin spots in the structure which need reinforcement. A fiberglass fabric patch shall be applied whenever corrosion or erosion has removed the safety factor of the steel (generally > 50% of original thickness). A structural repair should be performed when the minimum design thickness of the steel has been breached. Mark the areas to be repaired with compatible zinc primer or epoxy paint.

Wherever a thin spot or hole is detected, a repair patch with a minimum radius of one foot outside the edge of the thin area shall be applied per steel repair instructions. An exterior patch is necessary wherever a full penetration has occurred. An area with a minimum radius of six inches should be ground or sandblasted around the hole and a fibermesh repair patch applied to the prepared area per steel repair instructions.

**Steel Repair:** Fiberglass fabric may be rolled into the resin or chopped glass spray applied with the resin for added tensile and flexural strengths. Fiberglass fabric - A prime or tack coat of thicker grades of AquataPoxy shall be applied to the targeted areas until a 40-80 mil thickness (depending on surface type and specifications) is achieved on all surfaces including voids and holes. Sufficient primer should be applied to completely bond the fibermat to the substrate with minimum fraying and to substantially wet out the fibers.

Prior to gelation of the prime coat, sheets of 9 oz/yd2 (or heavier as required by project engineer or specifications) fiberglass fabric should be rolled into the prime coat until fully wetted and embedded including all edges and loose fibers. After the fiberglass embedded epoxy has gelled and is solid to touch (but not longer than the maximum recoat window of the product) loose fibers should be trimmed or ground smooth.

Depending on surface type and specifications, an additional 30-65 mils thickness of AquataPoxy should then be applied to the surface of the epoxy fibermat. If necessary, additional coats and fiberglass layers may be applied to achieve greater thickness and strength, fill remaining voids or cover exposed fibers.

## Section 3: COATING APPLICATION

AquataPoxy products are thermosetting, two component 100% solids epoxy systems that combine fixed ratios of resin to hardener to provide corrosion protect and restoration properties. The handling characteristics and curing time of any thermosetting system is greatly affected by its temperature and the temperature of the surface to which it is being applied. The higher the temperature of the components or of the substrate or environment, the faster curing will take place. To ensure that the product handles in the way in which it was designed and that you have sufficient pot or working life, it is recommended to store the materials at room temperatures (preferably 70-80˚F) for at least 24 hours prior to application and review the product data sheet for specific product characteristics.

**Outgas Prevention:** Outgassing of entrapped air is the only method pinholes can form in solvent free AquataPoxy. Products should therefore be applied during the cooler times of the day when the sun is less direct, or at night to avoid substrate outgassing of entrapped air. To avoid outgassing, care should be taken to avoid application on concrete and masonry structures exposed to direct sunlight or rising temperatures during the application and set time (4 hours after). Tenting, shading or night application will help mitigate outgassing, although other substrate factors can still influence this.

Green concrete is still curing and producing gas that can cause pinholing. Thinner primers may assist in densifying the surface of green concrete prior to topcoating although all the above rules should still be followed.

**Pot Life and Working Time Variables:** Pot life and working time are affected by three criteria: temperature, thickness or mass of the coating and the presence of an aggregate or heat sink. In general, the following guidelines may be used:

1. Higher temperatures of either product components or the application surface will accelerate the cure and set time of the product. To retard the chemical reaction of this two-component system, you may either reduce the temperatures of the components or reduce the temperature of the substrate. The reverse is also true. The ideal temperature of the components during spray application is 125-225˚F, depending on the product and component. If hand applying, the components can be heated to 125˚ F.

2. Unlike evaporative paints where the thinner the paint the faster it dries, the cure time with thermosetting materials is inversely proportional to the thickness. The thicker thecoating and greater the mass, the more heat that is generated producing a shorter set time.

3. The presence of a heat sink can also reduce curing time. A heat sink is anything that can absorb the heat of the reaction, such as a cool substrate, and therefore slow the cure time. The addition of an aggregate to the epoxy mixture can also absorb heat and reduce the reaction time. The addition of more or larger aggregate particles will increase the cure time even further.

**MIXING**

The following procedures are to be followed when mixing the resin and hardener prior to application:

**Hand Mixing/Filled Systems:** Mix the resin (Part A) portion thoroughly for 2-3 minutes using an electric or air drill mixer prior to addition of the hardener (Part B). To ensure proper ratio, mix only full kits. Care should be taken to follow manufacturer specifications for mixing ratios depending on the specific product being used. Add the hardener and continue to mix thoroughly an additional 2-3 minutes. The system is now ready for application.

If desired, up to three parts by volume of dry mixed silica sand (or other approved dry aggregate) to one part epoxy may be added to extend the product and create a textured surface or trowelable mortar. Your own tests should be done first to determine which aggregate provides an optimum blended mixture (no dry clumps) and the surface texture desired. Generally, #4 blasting sand will provide a relatively smooth surface, while #3 sand will provide a good skid-resistant texture.

**APPLICATION**

Once the two components are mixed, a chemical reaction is initiated and heat begins to be generated. AquataPoxy products are relatively fast setting and it is important that application begins as soon as mixing is complete. By removing the product from

the mixing container (when hand mixing vs. spray application) you will lengthen your working time (i.e. dispersing the product mass). When manually applying AquataPoxy, it is common to immediately dump the mixed epoxy on to the horizontal surface to be applied and squeegee or roll into place. If a spray system is being used, begin spray application immediately. Whether hand or spray applying, for quality assurance, it is recommended that at least two coats be applied.

**Spray Application:** Cohesant Materials recommends using a Raven Certified Applicator with a Raven designed and approved plural component airless spray application system designed and certified for use in field applications of AquataPoxy. For OEM shop applications, contact Cohesant Materials for equipment design requirements.

**DESIGN THICKNESS**

Typical minimum and nominal thickness recommendations differ from product to product, depending on the service environment, atmospheric or immersion duty, and profile of the prepared surface.

- Concrete, New/Smooth: 80-100 mils for immersion, 60-80 mils for atmospheric, splash and spill exposure.
- Concrete, Rough: 100-125+ mils
- Masonry/Brick: 125-150+ mils
- Steel: 25-80 mils for immersion, 16-40 mils for atmospheric, splash and spill exposure; also profile dependent.
- Fiberglass System: 40-60 mil tack coat, 9 oz/yd2 fabric, 40-60 mil top coat. Varies with circumstances.

(Thicknesses shown above are for general purposes only, each project should be evaluated independently and thickness of system determined upon product, service environment, protection and restoration requirements.)

Contact Cohesant Materials for specific recommendations.

## Section 4: INSPECTION AND TESTING

Protective coatings must be monolithic, thick enough and well adhered to perform their designed functions. Proper quality control and assurance can be ensured by the following techniques:

**Thickness:** During application a wet film thickness gauge should be used to ensure a monolithic coating and uniform thickness during application.

**Touch-Up:** After the coating has set hard to touch it should be visually inspected. Touch-up can be made by lightly abrading the surface with grit paper, cleaning the surface to remove debris, dust or other contaminants, and brushing over the area with a mixture of the same material used for the coating per manufacturer's instructions.

**Final Inspection:** The inspector shall visually check the applied coating for evidence of pinholes, blisters and confirm even coloring, proper mix ratio, coverage and cure. Deficiencies in the finished coating shall be marked and repaired in strict accordance with the manufacturer's recommendations.

**Thickness:** After the coating has set hard to touch (time will be dependent on conditions), it can be tested with an ultrasonic thickness gauge or destructive testing to confirm specified thicknesses.

**Holiday Detection:** After the coating has set hard to touch, it can be inspected with high voltage holiday detection equipment. An induced holiday should be made onto the coated concrete surface and serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced holiday.

All detected holidays should be marked and repaired per the manufacturers recommendations.

**Adhesion/Bond Strength:** After the coating has set hard to touch it, can be tested to measure bond strength of the coating system to the substrate. ASTM D4541 can be successfully modified for most field situations. Measurement of bond strength should be made at regular intervals and along different sections of the coated surfaces. The Project Engineer should evaluate any areas detected to have inadequate bond strength. Further bond tests may be performed in that area to determine the extent of potentially deficient bonded area and repairs should be made per manufacturer's recommendations.