

AQUA-RESIN®

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EXTERIOR USE

Aqua-Resin can be used successfully in exterior applications; however, a few simple rules and precautions need to be followed.

One general precaution is that even if a part has proved to be sufficiently strong and durable for years in an interior environment, it does not mean that it was fabricated suitably for exterior use. (The reverse of this is true however; any part that is fabricated for exterior use will be suitable for interior use.)

Here are some specific procedures for exterior use:

- 1- *Thermal Expansion:* An important consideration for exterior use is the thermal expansion of the various *Aqua-Resin* layers. *Aqua-Resin* like virtually all materials will expand and contract with temperature changes. Therefore it is important that all layers be made with the same L/S3 mix ratio, as well as the same percentage and type of fiberglass. If different layers are mixed at different ratios, and/or with different fiberglass types and percentages, they will very likely expand and contract at different rates during temperature changes. The more extreme the temperature changes, the greater the difference in expansion. This uneven expansion can very easily lead to layer delamination, with the top-most layer detaching and falling away from the body of the part.

The ideal application method generally, but even more importantly in locales with significant temperature extremes, is to add each layer wet into wet or at least onto a not-yet-fully cured layer. Please also note that applied patches, with a different mix ratio, to make a patching putty will also be subject to this expansion phenomenon and should therefore be avoided. Patching at any point, when first fabricating the exterior part or as repair at a later date should always include either some *Aqua-Glass* or *Aqua-Veil* to help eliminate the possibility of cracking. In all cases if adding fresh material to fully cured surfaces the substrate surface should be sanded, scored or otherwise abraded. Drilling holes into the area to receive the patch will offer a “mechanical attachment” which will further increase the likelihood of the patch permanently adhering.

If a finished part is to have an applied texture, it is best to apply the texture to the model from which a mold is to be made, rather than apply a texture to the otherwise finished part. In the case of a part that is not made from a mold, such as an *Aqua-Resin* coated foam sculpture, insure that the surface upon which the texture is to be applied is roughened adequately to insure a good mechanical bond and that the applied *Aqua-Resin* mix for the texture is the same mix ratio as the

substrate surface. If this applied texture is to be subjected to extreme weather conditions, it would be best not to employ THX-6 as a thickener for this texture.

Additionally, thermal expansion can affect the attachment of various materials used as a supporting armature. It would make sense to have some flexibility or freedom of movement at the attachment points of an armature. In parts larger than perhaps the size of an adult human figure, if the design permits, expansion joints similar to those used in building construction would also be advisable.

Another related problem with thermal expansion is the use of rigid foam armatures. Please see #7 below:

- 2- *Standing Water:* To maintain structural integrity, *Aqua-Resin* should not be placed in or allowed to have standing water (or perhaps even snow) accumulate around it. *Aqua-Resin* will not dissolve in water, but after some time of soaking the bond between the *Aqua-Resin* matrix and the *Aqua-Glass* or *Aqua-Axial2* can be temporarily lessened. For the same reason, an exterior part should not be placed on or below grade; damp soil will have a similar effect. Sculptural pieces might best be mounted on a pedestal or slab with proper drainage to prevent pooling at the base. Water collecting in a “pool” or “bowl” due to the geometry of the part would also be a problem as just explained, but would also be a problem in freezing temperatures because freezing water expands considerably and could cause cracking of the wall of the part.
- 3- *Ventilation:* Another consideration for exterior use is ventilation. Since *Aqua-Resin* should not be subjected to soaking conditions, it is best if it dries thoroughly, in a reasonable time, after a heavy rain shower for instance. Hollow parts should easily do this, especially if they have an open area to allow air penetration. Parts made with a rigid foam armature might theoretically have an extra ventilation problem, but so far, in fact, we are not aware of any instances of properly made rigid foam armature parts having less outdoor longevity than those fabricated in molds with no foam core. (Please see # 7 below).
- 4- *Protection:* *Aqua-Resin* being formulated from acrylic resins, with a proven history of UV resistance, and from gypsum being substantially opaque should need no further protection from UV. Exterior coatings are however recommended in most situations, not only to protect the surface from soiling, but also to reduce or eliminate water penetration. Various penetrating sealers and clear coats that are typically used for masonry can be employed. For colored coatings, most exterior paints selected for their particular properties based on the requirements of the installation should be used. The particular paint or coating is often best chosen at the actual locality where the part is to be installed; local conditions usually dictate the offerings by local coating suppliers. It is not possible

to make a single recommendation for a coating that would be suitable for every climate. A paint which might, however, have something close to a universal applicability in terms of locale are marine or “yacht paints”. They are in fact formulated to be used in various environmental extremes. A single-component urethane, rather than a two-component one, might be the best choice not only from the point of view of health and safety (no isocyanates) but also because it is the more physically flexible of the two.

- 5- *Glass Content/Wall Thickness—in situations where extreme or repeated water penetration is to be expected:* While the recommended *Aqua-Glass/Aqua-Axial-2* content, by weight, for maximum strength in an interior part is 8-10%, the *Aqua-Glass/Aqua-Axial-2* content for applications where possible water penetration could be significant should be reduced. In extreme cases, as little as 4% glass content might be best. As the glass content is reduced, what might have been a 1/8” wall thickness might be increased to as much as 1/4”.
- 6- *Engineering/Appropriate Use:* *Aqua-Resin* is designed to be suitably strong for its intended uses. It should not however be considered a structural material. Especially in cases where there is likely public interaction in an exterior setting, common sense and good practice would indicate that the project be suitably engineered, with the possible addition of a supporting armature. Qualified engineers should be consulted in applications where public safety could be involved.
- 7- *Rigid Foam Armatures:* The use of rigid foam for exterior use requires some special considerations. There are two significant problems that need to be addressed. One is that rigid foams expand and contract with change in temperature; the other is that if the foams are in contact with water they will absorb it, with perhaps EPS absorbing the most water because of the spaces between the individual beads in the foam.

To address the foam expansion/contraction problem, a properly built outer shell should have enough strength and structural integrity to withstand the expansion/contraction of the foam, with the foam collapsing in on itself, rather than rupturing the *Aqua-Resin* outer shell. Regarding water uptake, with the possibility of subsequently freezing and therefore expansion, it is best not to site the part so that it is likely to take up water. It would also make sense to seal the surface as described above.
- 8- *Continuous Outer Skin:* When possible, the weatherability of any fabricated part will be greatly improved if the outermost layer of the part is one continuous skin. This will help insure the unbroken continuity of the surface even if there are any internal strength issues. This can be achieved by laminating a layer of either 30 mil *Aqua-Glass* or *Aqua-*

Axial-2 as part of a gelcoat into a mold or, as appropriate, over the surface of the otherwise finished part.

The above recommendations and instructions provided for Aqua-Resin® products are presented in good faith and believed to be correct and accurate. However, since user methods and conditions of application are entirely beyond our control, this information is offered without warranty. The user is advised to do their own testing to determine suitability for their particular application.

The information in this document relates only to the specific materials designated, and to the specific Aqua-Resin products identified in our instructions. It does not relate to use in combination with any other materials or processes.

These recommendations are updated from time to time and therefore we suggest, before starting an exterior project, that you please contact us to insure you have the latest information.

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