Technical information

ACRYLITE® extruded sheet (FF)

#9 Painting and Printing

This brief gives advice for:

- **Equipment and Materials**
- **Procedures**
- **Trouble Shooting**

Equipment and Materials

The crystal clarity and long-term weatherability of ACRYLITE® sheet allow for painting and printing on fabricated signs, displays, and other decorative items. Using the correct materials will help you produce a quality product.

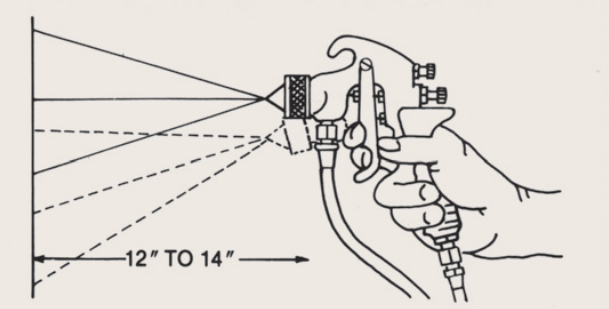
Paints

The increased use of ACRYLITE® sheets in signs and other decorative applications has led to a variety of paints designed especially for acrylics. Most are supplied as concentrates and require thinner to obtain the correct viscosity. As a rule, use mild thinner consisting of an alcohol blend, rather than one containing aromatic hydrocarbons. Benzene and toluene are two examples of aromatics. Follow paint supplier's recommendations on the amount and type of thinner.

ACRYLITE® sheets' extraordinary transparency allows backpainting – applying paint to the side of the material that will not be exposed to the weather. Thus, the unpainted outer surface of the acrylic provides weather protection for the paint.

However, if you must paint the outer surface, apply a protective coating over the paint. Paint suppliers can recommend a suitable coating.

Spraying Systems



Any efficient atomizing spray gun system, which will uniformly distribute paint, may be used. Consult equipment suppliers regarding the equipment needed for a particular application. Many paint suppliers also publish excellent manuals which provide up-to-date equipment suggestions.

To obtain atomizing air, the available line pressure should be in the range of 60-90 psig. Use a 25-ft, 5/16" minimum diameter hose to avoid pressure drops in the line. The air compressor should be large enough to provide the volume and pressure required for all guns. It is important to control water and oil in the

atomizing air since this will spot the paint and cause non-uniform distribution. Water and oil traps in the line will alleviate the problem. Equipment cleanliness is crucial to uniform paint dispersion. Place metal screen strainers at the pressure tank and spray gun. Clean these items and the spray gun daily. Install a spray booth large enough to fit your largest work piece. Make sure it is adequately vented according to building code regulations. It is important to use a light box to judge paint uniformity on transparent plastics. Be sure the light box conforms to building code regulations for a spray painting area.

Procedures

Be sure to follow the manufacturers' safety recommendations for equipment and materials used with ACRYLITE® sheet.

Fabrication Techniques

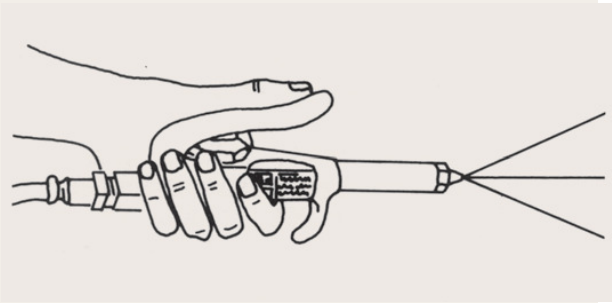
If you fabricate ACRYLITE® sheet prior to painting, incorrect technique may cause heat build-up, resulting in crazing (numerous tiny cracks in the material) after painting. Fabrication Tech Briefs #2 through #8 discuss many aspects of fabrication. To ensure that crazing will not occur, review these briefs to assure your fabrication techniques are correct.

Cleaning

Clean ACRYLITE® sheet before painting to remove dust and assure paint adherence. Since acrylic sheet is sensitive to solvents such as aromatic hydrocarbons, concentrated alcohol, and ketones, use care in cleaning. Clean parts with a 25% solution of denatured alcohol and distilled water. However, for stains such as oil or grease, use a stronger cleaning agent such as hexane, aliphatic naphtha, or kerosene. Be sure the sheet is fully dry and clean before painting.

Static Neutralization

Before painting, it is important to neutralize electric or static charges that accumulate on the sheet's surface. Dust on the sheet causes paint agglomeration and uneven layers. Since tearing the masking off the sheet will create a static charge, all acrylic pieces should be treated. One common way to do this is with an ionizing air gun. These guns safely and effectively neutralize electric charges.



Alternate techniques, such as wiping the sheet with a damp, lint-free cloth or cleaning with a diluted alcohol-water solution, are also effective. Avoid anti-static cleaners since they may leave a residue and cause paint adhesion problems.

Maskants

The protective paper masking is usually used as a protective layer for spray painting flat signs. However, many paint manufacturers also distribute liquid maskants, which are commonly used to spray paint designs onto ACRYLITE® sheet. Maskant is supplied as a thick liquid consisting of water-soluble latex resins in solution. Because they are water solutions, maskants must be stored above 32°F to prevent freezing. Application is through the use of air or airless atomizing spray equipment – see the drawing on the first page of this brief.

Clogging may occur due to dried film mixed with the solution. To prevent this, obtain a special nozzle that reverses the flow of product and cleans out the build-up. Spray the film on evenly to a wet thickness of 10-12 mils, which will dry to above 4-5 mils.

Maskant Drying

Drying time is usually about 2 hours, although it is better to plan overnight drying to assure complete evaporation. Drying can be accelerated by using forced-air heating at 110°F – do not go above this temperature as doing so might dry the surface and prevent evaporation of the water in the layers beneath.

Leave the dried film in place until you are ready to paint to prevent dust accumulation on the plastic surface. Just before painting, score the design on the film using an X-Acto knife (available in art supply stores), giving it just enough pressure to cut the film without scratching the plastic. After painting, leave the film in place until the paint is thoroughly dry. Otherwise, you will get smeared paint and uneven edges.

Painting

Before painting, practice on a few test pieces to be sure that paint viscosity and air pressure are correct. Too high a delivery rate will result in too much paint and cause paint sag. It may also cause crazing due to too much solvent. Too low a delivery rate will result in "dry spray", a matte surface caused by too much dusting. As a rule, use the lowest pressure at which you obtain correct results. Hold the gun 12-14 inches from the workpiece – too close or too far will cause the above listed defects. Move the gun at an even pace and in a straight line. Its movement should never start or stop directly on the sheet surface. Vary the direction of the spray, horizontally and vertically, to assure uniform coverage. Usually, four or five passes with several seconds between coats will provide sufficient paint. As mentioned, a light box behind the ACRYLITE® sheet will help in judging the uniformity and intensity of color.

Paint Removal

If you need to remove paint from the surface of ACRYLITE® sheet, take it off immediately with the paint manufacturer's recommended cleaner. Apply the remover using a rag; wipe off paint using a clean rag. Because paint removers contain organic solvents, minimize the time the remover is in contact with acrylic to reduce the chance of crazing.

Screen-Printing

Screen-printing is used for volume production. It is fast and economical. For beginners, it is best to purchase a screen from a local screen supply house. After setup, apply paint with the squeegee in a uniform, even motion in one direction. It will pass through the open mesh on the screen, transferring the pattern onto the acrylic. The most important factors in the screening process are the paint's viscosity and the size of the mesh openings. These will determine paint flow through the screen and the paint's appearance on the acrylic. Since many different fabrics are used for screening, and paint viscosity depends on the application and temperature conditions- it is difficult to generalize what these conditions should be. Paint manufacturers give advice on thinning paint. Consult these companies should you need information.

Digital Printing

Printers can generally be divided into two categories:

- **Continuous flow** – systems which provide a constant flow of ink with a portion of this flow being re-circulated. Ink is deposited on the printing surface by electrostatic charges.

- **Drop on demand (DOD)** – systems which expel ink from the printing heads only when needed. DOD systems can be further broken down into the following two categories:

- *Thermal – printers that gasify the ink immediately prior to application*
- *Piezo – printers that mechanically supply liquid inks to the substrate*

Thermal DOD printers, historically, benefited from lower initial cost at the expense of more maintenance to the printing heads due to clogging, and wear of nozzles. Piezo DOD systems while costing more initially require less maintenance. An additional benefit of piezo printers is the ability to use more heavily pigmented inks that are better for outdoor applications.

The present day's demand for more durable prints coupled with reduced printer costs have, over time, made piezo systems the dominant type of printer. Piezo systems use one of two main types of inks:

- Solvent – includes water based, eco- solvent, and petroleum based solvent
- UV curable

Piezo printers are designed to use either UV curable or solvent based inks, not both. Either of these ink types can be formulated using dyes, pigments, or a combination thereof. Generally inks will include some level of pigments in order to have good outdoor durability and opacity.

Solvent printers are a more mature technology and represent the vast majority of installations. Primarily solvent printers are used for roll to roll or flexible media with few installations set-up for rigid media or sheet. UV printers, driven in part by growing environmental concerns with the use of solvents, represent the fastest growing market for printers.

Whether printing with a solvent or UV machine, print adhesion is in large part determined by the ink. It is typical that printer manufacturers will offer only one choice of ink for their machines. Ink selection is therefore primarily dictated by machine selection.

When considering a UV digital printer, acrylic and polycarbonate sheets will provide similar ink adhesion and durability. Adhesion may be improved by wiping the substrate with isopropyl alcohol immediately before printing. Care should be taken to wipe away this alcohol as prolonged and repeated exposure can cause crazing (chemical attack) of the sheet.

For demanding applications where high adhesion and resistance to scratching is important, "rigid" UV inks are a good solution. Currently "rigid" inks are used only in conjunction with a few brands of printers. The Dhurst Rho 600 and select Raster printers are two examples. Prints made using these printers with the rigid UV ink on ACRYLITE® sheet exhibit excellent adhesion and scratch resistance.

Trouble Shooting

The problems listed below represent the most common concerns when painting ACRYLITE® sheet. Most paint manufacturers publish excellent paint manuals that contain much more detailed information on trouble-shooting paint problems. Consult these manuals or the paint manufacturer regarding problems not covered here.

Problem	Cause	Solution
Maskants		
Weak and brittle maskant	Air bubbles in film	Dilute slightly
	Film not thoroughly dry	Wait recommended drying time
	Maskant film too thin	Increase film thickness to 3-5 mils (10-12 mils wet)
Too much adhesion	Maskant film too thin	Increase film thickness to 3-5 mils (10-12 mils wet)
	Coating exposed to UV	Do not store faces outside
Spray Paints		
Poor adhesion	Incorrect paint	Use paints recommended for use with acrylic
	Direct or residue on sheet	Clean sheet thoroughly before painting
Blotches of paint	Static electricity	Neutralize charges with ionizing gun
		Wipe with damp cloth
	Uneven paint application	Apply paint in more passes using less paint per pass
	Paint not applied uniformly	Use back-lightning to check paint as its being applied
Screen Paints		
Poor Detail	Screen mesh too coarse	Use a finer mesh screen
	Paint too thin	Use less thinner
	Worn screen	Replace screen
Paint drying on screen	Hot, dry weather	Add retarder to slow paint drying
	Too much time between screening	Flood screen between passes
	Stress from fabrication	Review fabrication techniques—Tech Briefs 2-8
Crazing	Flame polishing	Flame polish as last step
Digital Printing		
Ink is brittle	Too much UV cure time	Adjust print conditions for less UV sure time
Poor adhesion	Dirt or residue on sheet	Clean sheet with 50-50 water plus IPA mix
	Wrong masking	Do not use sheet with adhesive based masking
	Insufficient dwell time	Adjust print conditions for additional cure time

Fire Precautions

ACRYLITE® sheet is a combustible thermoplastic. Precautions should be taken to protect this material from flames and high heat sources. ACRYLITE® sheet usually burns rapidly to completion if not extinguished. The products of combustion, if sufficient air is present, are carbon dioxide and water. However, in many fires sufficient air will not be available and toxic carbon monoxide will be formed, as it will when other common combustible materials are burned. We urge good judgement in the use of this versatile material and recommend that building codes be followed carefully to assure it is used properly.

Compatibility

Like other plastic materials, ACRYLITE® sheet is subject to crazing, cracking or discoloration if brought into contact with incompatible materials. These materials may include cleaners, polishes, adhesives, sealants, gasketing or packaging materials, cutting emulsions, etc. See the Tech Briefs in this series for more information, or contact your ACRYLITE® sheet Distributor for information on a specific product.

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