

## Fabrication

### #8 Cementing

This brief gives advice for:

- Equipment and Materials
- Procedures
- Trouble Shooting
- Equipment Suppliers
- Additional Technical Information & Assistance

#### Equipment and Materials

ACRYLITE FF acrylic sheet can be easily joined to itself or other acrylic surfaces with many commercially-available solvent cements. These cements are available from Authorized ACRYLITE Sheet Distributors.

All cements should be used only in well ventilated areas with the proper protective equipment as recommended by the manufacturer. Also, before using any solvent or cement, obtain and review the Material Safety Data Sheet (MSDS), available from the manufacturer, for that particular product.

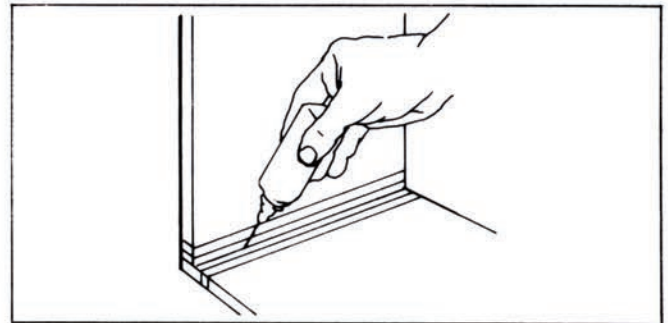
If the joints to be cemented are hard to reach or the parts don't fit together precisely, you may prefer to use viscous cement, also available from ACRYLITE sheet distributors.

Other items needed are likely to include a solvent cement applicator (needle-nosed plastic container shown above; see equipment suppliers listed at the back of this bulletin), pins or wire brads, and a dip or soak pan. Each of these items is pictured in this brief; the former is used for capillary cementing and the latter two are used for dip or soak cementing. You may also need forms, clamps, and weights of the proper sizes and shapes for the pieces to be cemented.

#### Procedures

Observe these basic precautions when working with acrylic solvents:

- Work in a well-ventilated area.
- Do not smoke. Solvents are highly volatile and may be flammable.



- Protect skin from contact with cements and solvents.
- Do not attempt to cement ACRYLITE FF acrylic sheet when room temperatures are under 60°F or over 100°F. Temperatures between 70 and 75°F are ideal.
- Be sure to follow the manufacturers' safety recommendations for equipment and materials used with ACRYLITE FF sheet.*

#### Preparation

The first step is preparing the area to be cemented. Edges must be cleanly cut and/or properly machined. If a dull blade was used for a saw cut, resulting in a melted or chipped edge, contact between the sawed edge and solvent may result in crazing of the material. Finish all rough edges on a jointer, shaper or edge finisher. If you cannot do so, wet-sand the edges with a flat surface or block.

Do *not* polish edges which are to be cemented. Polishing will produce a convex edge with rounded corners and will result in an unsightly, weak joint. Also, a flame-polished edge may craze when it contacts solvent cement.

Crazing may also occur if internal stresses from shop fabrication are high. To eliminate such stresses, anneal the piece at 180°F (80°C). When annealing, the heating time and the cooling time in hours should *each* equal the material thickness in millimeters, up to 6 mm. For example, you would heat a 3 mm-thick sheet (0.118") for three hours and allow it to cool gradually for three hours.

For thin sheet, the annealing (heating) time should not be less than two hours. It is not necessary to

heat any piece for more than six hours, though it will not be harmful if heating time is extended due to shift schedules, etc. Remember—each hour of heating time requires a corresponding hour of cooling time.

### Capillary Cementing

Capillary cementing is probably the most popular way of joining ACRYLITE FF acrylic sheet. It works because of the ability of low-viscosity solvent-type cement to flow through a joint area by capillary action. Properly done, capillary cementing yields a strong, transparent joint.

Solvent cements are available from ACRYLITE acrylic sheet distributors. They can recommend the best ones for your projects. See the suppliers list on the following page.

Before using any solvent or other type cement, be sure to obtain and review the Material Safety Data Sheet (MSDS) for that particular product. MSDS's are available from the manufacturer. In addition, adequate ventilation must be provided and the manufacturer's guidelines for proper use should always be followed when using solvents.

To capillary cement, first make sure all parts fit together properly. Then, join the pieces together with masking tape or clamp them into a form that will support the pieces and hold them firmly in place.

When solvent cementing ACRYLITE FF acrylic sheet, keep the joint in the horizontal plane and space the two edges with shims. Use .004 inch shims with sheet  $\frac{1}{4}$ " or thinner and .008 inch shims with sheet thicker than  $\frac{1}{4}$ ". Insert shims every two feet for long edges.

Let the cement soak into the edges 45-60 seconds before removing the shims. At this point, the surfaces will be soft. Apply a small pressure of about 0.7 to 1.4 lb./sq.in. (50-100 grams/sq.cm) for three minutes, until the joint is set.

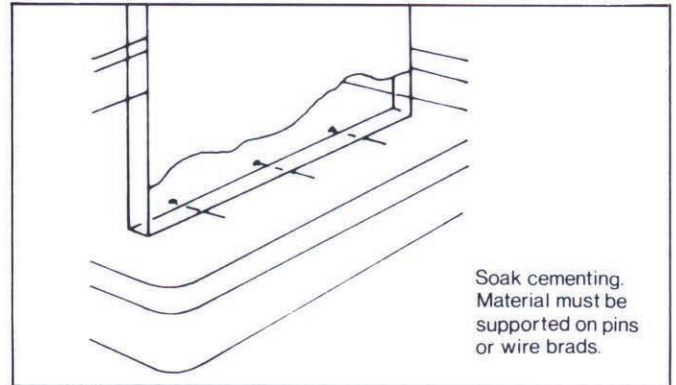
If the cement does not flow completely into the joint, tilt the vertical piece very slightly (about  $1^\circ$ ) toward the outside. This should allow the solvent to flow freely into the entire joint. Then, tilt the piece back again for a square corner.

The initial bond forms in five to ten seconds. Wait three hours before doing subsequent processing. High strength is reached in 24-48 hours. Strength will continue to build for several weeks.

### Dip or Soak Cementing

Pour a moderate amount of solvent cement into a dip or soak pan. Dip the edge of one of the pieces to be joined directly into the solvent as shown. It is important that only the edge be dipped—

exposing too much area to the solvent will produce a weak, slow-setting joint.



Leave the piece in the solvent 20 seconds for thin sheet and 30 seconds for relatively thick material. The time varies for different solvents and bond strength requirements—experience will help you plan the correct dipping time. Consult CYRO's technical group (last page of this brief) if you need advice.

When you remove the sheet from the cement, hold for a few seconds at a slight angle to allow excess solvent to drain off. Carefully, but quickly, place the soaked edge precisely in place on the other part to be joined. Hold the parts together for about 30 seconds without applying pressure. This will allow the solvent to work on the surface of the piece that wasn't dipped.

After 20 seconds, apply some pressure—just enough to squeeze out the air bubbles. Don't apply too much pressure as doing so will squeeze out the cement.

When pieces are joined, the part should be placed in a jig or clamp to maintain firm contact for 10 to 30 minutes. Don't allow the parts to move during this critical time.

The initial bond forms in five to ten seconds. Subsequent processing can be carried out after three hours. The bond will achieve high strength in 24 to 48 hours. Strength will continue to build for several weeks.

### Viscous Cementing

Use viscous cements to join parts that can't be easily cemented by the capillary or soak solvent methods—either because the joints are hard to reach or because the edges don't fit together well. Viscous cement is thick. It will fill small gaps and make strong, transparent joints where solvent cements can't.

Viscous cements are available from ACRYLITE sheet distributors. Or, make your own viscous cement by dissolving chips of clear ACRYLITE acrylic sheet in a small amount of solvent. Let the

solution stand overnight in a tightly-covered container.

Remove the masking from around the joint area and carefully apply a bead of cement to one side of the joint using a brush, spatula, or the cement applicator. Then gently join the pieces together as described under 'soak cementing.'

A solvent-resistant tape (Riveter's tape from 3M Co.) may be applied to protect the area around the joint but it should be removed carefully after about five minutes, while the cement is still wet. Don't touch the parts at all for the critical first three minutes, or the joint will not hold. The part may be carefully moved after ten minutes.

### Trouble Shooting

<u>Problem</u>	<u>Cause</u>	<u>Solution</u>
<b>Bubbles in joint</b>	Uneven surface	Check joint preparation for squareness Use viscous cement
<b>Crazing</b>	Stresses in material	Use water cooling when sanding, etc. Anneal heat bent areas Dry before flame polishing Use proper ventilation when cementing
<b>Whitening of joint (solvent cement)</b>	Water in the cement Fast evaporation of cement	Replace cement Reduce evaporation rate by adding glacial acetic acid (1-3%)
<b>Weak joints</b>	Uneven surface  Cement problem	Check joint preparation for squareness Use viscous cement Check cement storage methods. Solvent evaporation can change cement properties.

### Equipment Suppliers

The suppliers listed below offer materials and equipment tested and approved by CYRO Industries. Authorized ACRYLITE Sheet Distributors may also offer materials and equipment.

#### Nozzled Bottles

*Plasticator & Syringes*  
Craftics, Inc.  
2701 N. Pulaski Rd.  
Chicago, IL 60639  
(312) 235-3307

*Syringes & Bottles*  
Gaunt Industries  
6217 Northwest Highway  
Chicago, IL 60631  
(312) 774-5658

#### Solvent Resistant Tapes

*Scotch Brand No. 685 Riveters Tape*  
3M Company  
Industrial Tape & Specialties Division  
Bldg. 220-8E-04, 3M Center  
St. Paul, MN 55144  
(612) 733-1441

## **Additional Technical Information and Assistance**

### **Technical Literature Available**

For more detailed information, see your local Authorized ACRYLITE Sheet Distributor or contact CYRO Industries. Literature is available for these and other topics:

#### **Physical Properties —**

#1121 — "Physical Properties of ACRYLITE FF Acrylic Sheet"

#### **Fabrication Tech Briefs —**

These cover individual operations of fabrication such as cutting, drilling, thermoforming, etc. Be sure to ask for the latest listing of available Tech Briefs from your ACRYLITE sheet distributor or CYRO Industries.

#### **Application Tech Briefs —**

These cover required fabrication operations for specific applications like glazing, signs, etc.

### **Fire Precautions**

ACRYLITE FF acrylic sheet is a combustible thermoplastic. Precautions should be taken to protect this material from flames and high heat sources. ACRYLITE FF acrylic 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 from other common combustible materials. 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.

**Important Notice:** The information and statements herein are believed to be reliable but not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. **NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE.** Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.

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