Technical information

ACRYLITE®

Working with ACRYLITE®

ACRYLITE® acrylic products are characterized by their outstanding weather resistance, superior impact strength and high optical quality. ACRYLITE® can be manufactured with many different functional properties and surfaces offering light diffusion, heat shielding, sight screening, sound reflection, UV filtering or mar resistance.

We utilize two methods of manufacturing ACRYLITE®:

ACRYLITE® cast is a cell cast acrylic made to exacting standards, offering excellent optical characteristics, light stability and low internal stress levels for consistent performance.

ACRYLITE® extruded is the highest quality continuously manufactured acrylic sheet on the market today. Using a proprietary innovative process, ACRYLITE® extruded products are economical, provide tight thickness tolerance, high optical characteristics and low stress levels.

Designers, fabricators, architects, engineers and end-users have come to rely on ACRYLITE® products to meet their unique challenges in a broad range of markets including P-O-P displays, store fixtures, conservation glazing, architectural interior, furniture, greenhouses, aircraft glazing and security applications.

First... Get to Know Your Material

ACRYLITE® is a high quality plastic. ACRYLITE® sheet is:

- **Lightweight:** half the weight of glass.
- **Break resistant:** withstands many times the impact force of glass of similar thickness.
- **Weather resistant**: virtually unaffected by sun, extreme cold, salt water spray.
- **Heat resistant:** ACRYLITE® cast takes a range of temperatures from -30°F (-34°C) to +200°F (93°C), though it may be affected by continuous temperatures in the 180°-200°F (82°-93°C) range. ACRYLITE® extruded can be used at temperatures from -30°F (-34°C) up to +190°F (88°C). It is recommended that temperatures not exceed 160°F (71 °C) for continuous service, or 190°F (88°C) for short intermittent use.
- **Colorfast:** the color is continuous throughout the material. Colored acrylic sheets are known for their outstanding durability.
- **Easy to work with**!

Characteristics of ACRYLITE®

ACRYLITE® sheet behaves differently from other types of material. Learn what it can do and what it can't do. Learn how to care for it. You'll be sure to get the best results.

- **Expansion and contraction:** Like most plastics, ACRYLITE® sheet responds to temperature

changes by expanding or contracting at a far greater rate than glass. When using ACRYLITE® for outdoor glazing, cut the sheet approximately 1/16" per running foot (0.5 cm) shorter than the frame size.

- **Flexibility:** ACRYLITE® is much more flexible than glass or many other building materials. When using large sheets for windows, it is important that rabbets or channels be deep enough to provide support against high winds (see page 12, "Glazing").
- **Electrical Properties:** ACRYLITE® is an excellent insulator. Its surface resistively is higher than that of most plastics. Continuous outdoor exposure has little effect on its electrical properties.
- **Chemical Resistance:** ACRYLITE® has excellent resistance to attack by many chemicals. It is affected, in varying degrees, by benzene, toluene, carbon tetrachloride, ethyl and methyl alcohol, lacquer thinners, ethers, ketones and esters. ACRYLITE® is not affected by most foods, nor are foods affected by it.

ACRYLITE® mar resistant (MR) acrylic sheet can withstand certain chemicals which come in contact with the coated side.

Light Transmission: Colorless ACRYLITE® sheet has a light transmittance of 92%, which is greater than glass. Translucent white ACRYLITE® diffuses light smoothly and evenly, so it's excellent for all types of lighting fixtures and signs. ACRYLITE® is also available in a large variety of transparent, translucent and opaque colors.

Fire Precaution: ACRYLITE® is a combustible thermoplastic. The self-ignition temperature range is 830-910°F. Protect it from flames and high heat. Refer to page 14 for further information.

The following table shows how the coating offers better protection against certain chemicals.

Chemical Resistance

Chemical	ACRYLITE® extruded	ACRYLITE® MR
Acetone	< 15 min	> 24 hrs
Ethylene Dichloride	< 15 min	> 24 hrs
Gasoline	> 24 hrs	> 24 hrs
Hydrochloric Acid	> 24 hrs	> 24 hrs
Methyl Alcohol	> 24 hrs	> 24 hrs
Methylene Chloride	< 15 min	> 24 hrs
Methyl Ethyl Ketone	> 15 min	> 24 hrs
Nitric Acid	< 15 min	< 24 hrs
Sodium Hydroxide	< 24 hrs	> 24 hrs
Sulfuric Acid	< 15 min	> 24 hrs
Toluene	< 15 min	> 24 hrs
Isopropanol	> 24 hrs	> 24 hrs
Kerosene	> 24 hrs	> 24 hrs

Testing for resistance to the above chemicals was conducted per ASTM D 1308. Time intervals for visually inspecting the sheet surface; 15 minutes, 1 hour, and 24 hours. The table shows the time it took the chemical to visually attack the surface.

Cleaning

Wash ACRYLITE® with a mild soap or detergent and plenty of warm water. Use a clean soft cloth, applying only light pressure. Rinse with clear water and dry by blotting with a damp cloth or chamois.

Grease, oil or tar may be removed with a good grade of hexane, aliphatic naphtha, or kerosene. These solvents may be obtained at a paint or hardware store and should be used in accordance with manufacturers' recommendations. Any oily film left behind by solvents should be removed immediately by washing.

Do Not Use: Window cleaning sprays, kitchen cleansers, gasoline, benzene, carbon tetrachloride or lacquer thinner.

A liquid detergent and water solution is recommended to clean ACRYLITE® mar resistant (MR). However, the following brand name cleaners have been tested and found to work well on the coated surfaces. Use care when cleaning since some of these cleaners may attack the uncoated sides or edges of the sheet.

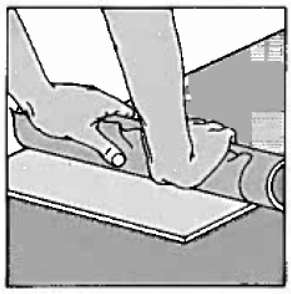
- Fantastik household cleaner
- Formula 409 household cleaner
- Mr. Clean household cleaner
- Glass Plus cleaner
- Top Job household cleaner
- Windex window cleaner

Static electricity can attract dust to ACRYLITE®. To reduce it, use an anti-static cleaner such as ACRIFIX® AC1010 or consider using a de-ionizing air gun.

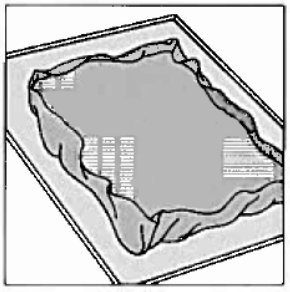
Masking

For all sheet types, the masking protects the sheet from scratching during storage and handling. *Be sure to leave the masking in place during most phases of fabrication and installation.* Except for intricate detail work, you should remove the masking only when your project is completed.

You can remove the masking paper with a cardboard tube—rolling the paper around it. All masked ACRYLITE® should be kept away from heat and sunlight, and masking should be removed soon after installation. If the adhesive has hardened, moistening the paper with aliphatic naphtha, hexane, or kerosene will help soften it. Never use a knife or scraper to remove masking.



Roll the masking paper onto a cardboard tube.



Roll the masking paper back about ½" to allow work on the edges of the street.

Some General Hints

Do's

- Keep masking on as long as possible through your fabrication operations.
- Wear safety glasses when working with power tools.
- Wear gloves when handling large sheets to prevent cuts.
- Use drill bits, carbide tipped circular sawblades and router bits that are designed or reground for acrylics.
- Make sure all your tools are sharp.
- Use water as a coolant when cutting sheets over 1/4" (6.0 mm) thick or drilling sheets over 3/16"(4.5 mm) thick.
- Use the right thickness for glazing panels and ensure there is sufficient rabbet depth to permit sheet deflection and thermal contraction without disengagement.
- Allow 1/16" per linear foot (0.5 cm per linear meter) for expansion in glazing applications.
- Use plenty of water when cleaning ACRYLITE® to help prevent scratching.
- Ask your ACRYLITE® distributor for detailed information.

Don'ts

- Don't store ACRYLITE® near radiators or steam pipes or in direct sunlight.
- Don't leave masking on if it will be exposed to the outdoors (sun or rain).
- Don't install large sheets with bolts; frame them instead.
- Don't mark with a punch marker.
- Don't use sawblades that have side-set teeth. Saw teeth should be carbide tipped with 0°-15° rake and slight radial clearance.
- Don't bring the material in direct contact with heaters.
- Don't subject the sheet to high surface temperatures during polishing.
- Don't use glass cleaning sprays, scouring compounds or solvents like acetone, gasoline benzene, carbon tetrachloride, or lacquer thinner.
- Don't heat ACRYLITE® in a kitchen oven.

ACRYLITE® can be sectioned in a wide variety of ways, with either hand tools or power tools. The method you choose will likely depend on the particular tools available to you, but all tools cannot

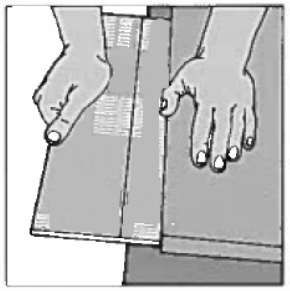
be used in all cases. Your choice of tool and techniques should be based on the type of acrylic sheet used, the thickness of the sheet, and the shape of the particular cut. This section, though not comprehensive, gives some guidelines for choosing the right tool, and using it properly to get the best results with ACRYLITE®.

Cutting with a Knife or Scriber

ACRYLITE® sheet up to 3/16" (4.5 mm) thick may be cut by a method similar to that used for cutting window glass. Use a scriber of some kind—a scribing knife such as the one pictured a metal scriber, an awl, or even a sturdy craft knife— to score the sheet. Draw the scriber several times [7 or 8 times for a 3/16" (4.5 mm) thick piece] along a straight edge held firmly in place. It is best not to remove the protective masking. Make the cuts carefully using firm, even pressure. For best results, make each stroke cleanly off the edge of the sheet.

Then, clamp the ACRYLITE® sheet or hold it rigidly under a straight edge with the scribe mark hanging just over the edge of a table. Protect your hands with a cloth, and apply a sharp downward pressure to the other side of the sheet. It will break along the scratch. Scrape the edges to smooth any sharp corners. This method is not recommended for long breaks or thick material.

Always draw the scribing knife along a straight edge.



Break sheet over edge of table after scribing.

Cutting with Power Saws

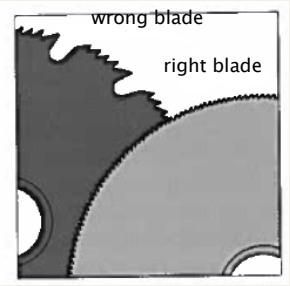
CAUTION! Wear safety glasses when working with power tools.

With any type saw, blades should be sharp, and free from nicks and burrs. Special blades for cutting acrylics are available for most types of saws. Your authorized ACRYLITE® distributor should have them in stock. Otherwise, use carbide-tipped blades designed for cutting plastics available at industrial products suppliers like Sears. Teeth should be fine, of the same height, evenly spaced, with little or no set.

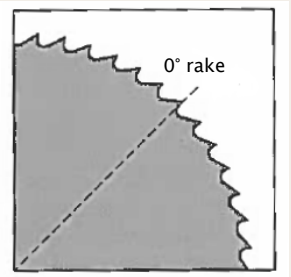
Table saws and circular handsaws: Use hollow ground, high-speed blades with no set, and at least 5 teeth per inch (25 mm), such as those used to cut copper and aluminum. If you intend to do a lot of cutting use carbide-tipped blades designed for plastics (a triple chip type tooth design is recommended). These give a cleaner cut in acrylic sheet. Set the blade to project approximately 1/8" (3 mm) above the surface of the sheet being cut. This will reduce edge chipping.

When cutting with a hand-held circular saw, clamp the sheet securely to the work surface to minimize vibration. A wood block 1" x 3" (25 x 75 mm) clamped on top of the sheet spreads the clamping force and can act as a guide for the saw.

No matter which type of saw you use, the sheet must be held firmly and fed slowly and smoothly to prevent chipping. Be sure the saw is up to full speed before beginning to cut. Water-cooling the blade is suggested for thicknesses over 1/4" (6 mm), especially when edge cementing will be performed.



For circular saws, use a metal cutting blade—not a combination blade



Teeth should be ground on the center line, and have 0° rake.

Saber saws: Use blades which have a slight set, such as the blades recommended for cutting metals or other plastics. Be sure they are sharp. The blades you use for cutting acrylic should never be used to cut other materials. Set them aside. Use them only for acrylic sheet.

High speed is best for cutting ACRYLITE® sheet with a saber saw. Always be sure the saw is at full speed before beginning to cut. Press the sawshoe firmly against the material, and don't feed too fast. Water cooling is suggested for cutting acrylic sheet over 1/4" (6 mm) thick.

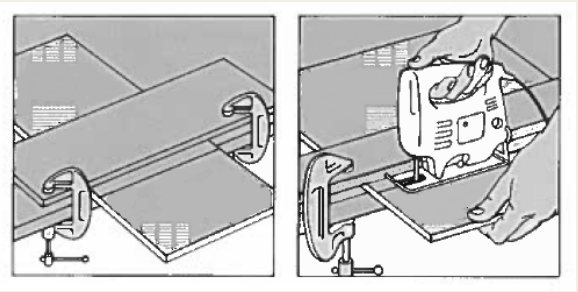
Band saws or jig saws: Band saws and jig saws are excellent tools for cutting ACRYLITE®. But because of their relatively thin blades, they are not recommended for cutting acrylic sheet over 1/4" (6 mm) thick. Use blades with a slight set, and about 10 teeth per inch (25 mm). Feed acrylic sheet at a rate 10 times faster than you would feed steel. Blades may break easily in acrylic, so operate accordingly.

Cutting with Hand Saws

ACRYLITE® sheet may be cut with almost any type of hand saw. And while good results are possible with hand saws, the techniques involved are considerably more difficult than with power saws. Practice on scrap material before attempting to make critical cuts.

With any hand saw, it is most important that the blades be kept sharp. For best results, the teeth should be of uniform size and shape, and have very little set.

Every effort should be made to prevent vibration or stress while cutting. Flexing at the point of the cut or binding of the saw blade may cause the acrylic to crack. Clamp the material securely. Keep the saw straight when cutting, and apply very little pressure. Let the blade do the work. With practice and proper care, you can get good results.



Clamp sheet firmly to table before cutting with a saber saw.

Use clamping strip as a guide for the saw.

Straight saws: Straight saws or cross-cut saws may be used for long, straight cuts on ACRYLITE® sheet of almost any thickness. The saw should have a hollow-ground blade with very little set and at least 10 teeth per inch (25 mm). Make certain the material is firmly clamped and supported. Hold the saw at an angle of about 45° from vertical, and be sure to keep it straight.

Coping saws: Coping saws or scroll saws are good for shorter cuts, curved cuts, or even intricate designs. Use very narrow blades with only a slight set.

Hacksaws: These hand saws for cutting metal may also be used for short cuts in ACRYLITE® sheet. Choose a blade with approximately 18 teeth per inch (25 mm). Use a smooth, even stroke. Apply very little pressure.

For more information on Cutting, please refer to Technical Briefs #2 and #3.

Routing and Shaping

ACRYLITE® can be machined with standard woodworking routers, in much the same way as wood. You'll find many uses for portable hand routers and small table routers. Use them to cut patterns into edges, or large holes out of pieces of ACRYLITE®.

For best results, use single-fluted bits for inside circle routing, and double-fluted bits for edge routing.

Routers are designed to operate at high speeds. 10,000 to 20,000 rpm is recommended for ACRYLITE®. And because routing speeds are so high, vibration must be scrupulously avoided. Even small vibrations can cause crazing and fractures in acrylic sheet during routing.

For more information on Routing, please refer to Technical Brief #5.

Turning

Turning is the only practical way to produce most round cross-sectioned parts such as knobs, furniture legs, and vases. ACRYLITE® can be turned on almost any type lathe.

Bits designed especially for cutting acrylic are available. But most high-speed tool bits with a zero degree or slightly negative rake will work very well. It is essential that the rake be maintained at 0° to 4° for satisfactory results. Clearance angles should be from 5° to 10°. Use a turning speed approximately 10 times faster than for wood. You should be able to get a continuous chip from the ACRYLITE® acrylic sheet.

Drilling

Any kind of hand or power drill may be used for drilling ACRYLITE® acrylic sheet. A stationary drill press is the preferred tool because it gives better control and greater accuracy. But a drill press won't be applicable in all instances, and with a little care, proper technique, and a correctly-ground drill bit, you can get good results with an ordinary hand drill.

For best results, use drills designed specifically for acrylics. They are available from your ACRYLITE® sheet Distributor. He or she can help you select the ones that are best for your job.

Regular twist drills can be used, but the cutting edges must be modified to prevent the blade from grabbing and fracturing the plastic. ACRYLITE® is relatively soft. Your drill should have an edge that cuts with a scraping action. To obtain this you can modify your drill bit by grinding small "flats" onto both cutting edges with a medium or fine-grit grinding wheel, or a pocket stone. The flats can be parallel to the length of the drill and about 1/32" (1 mm) wide. Tip angle should be between 60° and 90°.

For the best possible finish inside the hole, use a drill with smooth, polished, slow-spiral flutes which will clear the hole of all shavings without marring or melting the walls.

If the drill is correctly sharpened and operated by proper speed, two continuous spiral chips or ribbons will emerge from the hole.

When drilling a hole three times deeper than the diameter of the drill, a lubricant or coolant should be used. This will help remove chips, dissipate heat, and improve the finish of the hole. Rough, irregular, or fuzzy holes can lead to cracking and breaking months after the piece has been completed.

For more information on Drilling, please refer to Technical Brief #4.

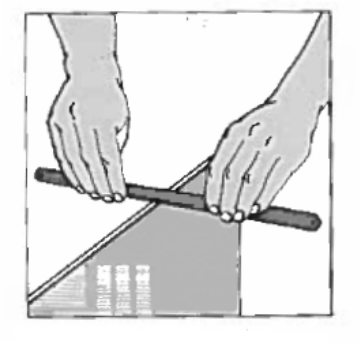
"Flats" ground into the cutting edge will prevent a drill bit from grabbing.

Grind 1/32" (1mm) flats with a fine-grit wheel.

Scraping

Many of the techniques used to cut ACRYLITE® can leave a rough edge that is usually unsuitable either as a finished edge, or to join to another piece of acrylic. It is necessary to smooth and square the edge of the sheet. You can do this by a number of different techniques, depending on the finish desired.

The first step, and perhaps easiest technique, is scraping. A scraper can be almost any piece of metal with a sharp, flat edge. The back of a hacksaw blade, the back of a knife blade, or a tool steel blank are ideal. Special acrylic scraping tools are also available from your ACRYLITE® sheet distributor. Whatever tool you use must have a sharp, square edge.



Edge scraping with the back of a hacksaw blade.

Filing

It is easy to file ACRYLITE® sheet to a surface ready for final polishing. The filing, however, must be done correctly, and carefully.

Almost any commercial file can be used. But the quality of the finish will depend on your choice of file coarseness. A 10 to 12 inch (250 to 300 mm) smooth cut file is recommended for filing edges, and removing tool marks. Other files—half round, rat tail, triangular files, and even small jewelers' files are good for smoothing insides of holes, cutting grooves and notches, or finishing detail.

File in only one direction. Keep the teeth flat on the surface of the ACRYLITE®, but let the file slide at an angle to prevent the teeth from cutting unwanted grooves in your work.

Always keep your files clean and sharp. Wire brushes them often to prevent the teeth from filling up. And don't use your acrylic files for working metal or other materials that might dull the teeth. For small work, try clamping the file in a vise, and rubbing your work across the file.

Sanding

Before ACRYLITE® is ready to be polished; it should be sanded to a smooth, satiny finish. As with filing, the quality of the final finish will depend on the grades of sandpaper used. The finer the final grit, the smoother the finish. It will usually take at least three steps to get a good finish.

First, if there are scratches deep enough to require it, start with coarse grit No. 120 sandpaper. Use it wet.

When the original scratches are completely removed, sand with a medium grit paper—220 is good—to remove the scratches from the coarse paper. Use the medium grit paper wet as well. Finally, sand to a satiny finish with a fine grit, wet-or-dry No. 400 paper. Fine grit paper should always be used wet to keep the paper from clogging and obtain a smoother finish. Rinse the paper frequently. Grits as fine as 600 may be used.

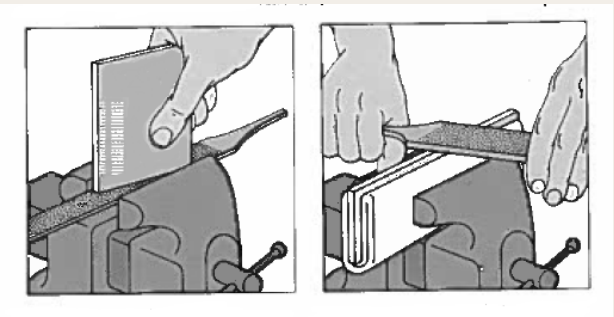
Always wipe your work clean when changing to a finer grit. Be sure all deep scratches have been removed.

Sanding by hand: Hand sanding ACRYLITE® is very much like hand sanding wood. Most of the same techniques apply. But sanding acrylic must be done with far greater care. You should always use a wooden or rubber sanding block. When removing scratches, be sure to sand an area that is slightly larger than the scratch. This will help prevent low spots. Sand with a circular motion. Use light pressure and plenty of water with wet-or-dry papers.

As you get the feel of working with ACRYLITE®, your own observations and experience will be your best guide to determining how coarse a grade to start with on each particular job, and how many different grades will be needed to do the job most efficiently. Don't be afraid to experiment with different sanding techniques and different types of blocks. You'll

learn a lot of new tricks—perhaps the very one you'll need to help solve your next problem.

Sanding with power sanders: Almost any commercial power sander can be used on ACRYLITE®. Naturally, different types of sanders are preferred for different operations. As a basic rule, use them as you do when sanding wood. They should, however, be operated with lower pressure, and at slower speeds. Experiment on scrap pieces. All wet or- dry machine sanding should be done wet—especially with grit sizes of 150 or finer.



For small work, clamping the file in a vise and rub the piece across it.

Slide the file at an angle to prevent cutting grooves into your work.

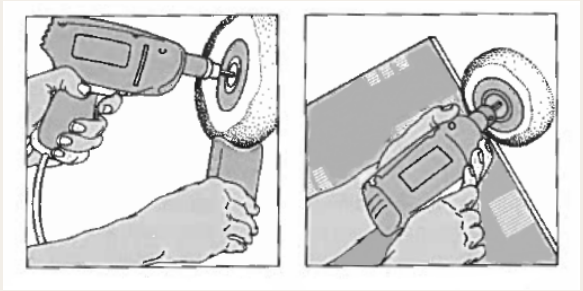
Note: ACRYLITE® mar resistant (MR) should be sanded on the uncoated surface and/ or edges only. Sanding will remove the abrasion resistant coating from the surface.

Polishing

The original high luster of ACRYLITE® can be restored to the edges and surfaces by polishing with a power driven buffer. It is also possible to polish ACRYLITE® by hand using a soft cloth and a very fine abrasive. But hand buffing is an extremely tedious process. You're likely to get a sore arm long before you get a finely polished surface. Power-driven buffing tools are recommended almost without exception.

Because inexpensive buffing wheels are available as an attachment for any electric drill, equipment should not be a problem.

Buffing wheels and compounds good for acrylics are sold by your ACRYLITE® sheet distributor, but special wheels are not really necessary.



Always use a buffing compound for polishing. Use it sparingly.

Edge polishing with a hand drill.

NOTE: Scratches or other damage to coated surfaces of ACRYLITE® mar resistant (MR) cannot be repaired by buffing or other methods of polishing.

A good buffing wheel for ACRYLITE® will consist of layers of 3/16" (4.5 mm) carbonized felt, or layers of unbleached muslin laid together to form a wheel between 1 and 3 inches (25 and 75 mm) thick. The larger the wheel, the better. But don't use one too large for your equipment. The wheel should reach a surface speed of at least 1200 feet per minute (370 m per minute). Speeds up to 4000 feet per minute (1220 m per minute) are useful for acrylics.

Solidly stitched wheels with rows of concentric stitching should be avoided. They are often too hard and may burn the acrylic. Never use a wheel at speeds higher than its rpm rating.

Never use a wheel that has been used to polish metal. Traces of the metal may remain to scratch the ACRYLITE®.

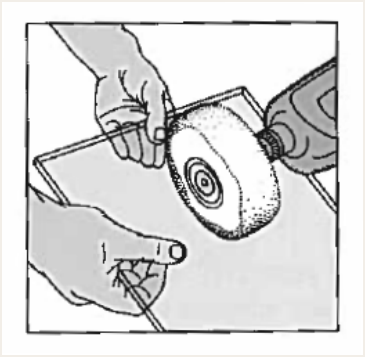
ACRYLITE® should be polished using a commercial buffing compound of the type used for polishing softer metals such as silver or brass. Or you can use a non-silicone car polish that has no cleaning solvents in it.

First, however, tallow should be applied to the wheel as a base for the buffing compound. Just touch the tallow stick to the spinning wheel. Then quickly apply buffing compound.

To polish, move the piece back and forth across the wheel until you get a smooth, even polish. Be careful not to apply too much pressure. And keep the work constantly moving across the wheel. This will help prevent heat buildup which can mark the surface by melting or smearing it.

For safety reasons, it is important not to start polishing near the top of the sheet. The wheel may easily catch the top edge, tearing the piece of ACRYLITE® out of your hands and throwing it across the room, or at you. Always wear safety glasses and be extremely careful.

Begin polishing approximately one-third of the way down the sheet, and keep moving it back and forth until you've reached the bottom edge. Then turn the sheet around and repeat the process on the other half.



Do not start at top of piece when polishing surface.

ACRYLITE® becomes soft and pliable when heated—behaving almost like a sheet of flexible rubber. It may then be formed into almost any shape. As the sheet cools, it hardens and retains the formed shape, provided it has been held in place during the cooling process.

The only functional difference between ACRYLITE® cast and extruded is the temperature ranges in which they are pliable. Do not exceed them.

Excessively high temperatures may cause the sheets to blister and burn. ACRYLITE® extruded will give better definition in tight radii or deep draws.

ACRYLITE® cast should be heated to between 340° and 380°F (171° and 193°C).
ACRYLITE® extruded should be heated to between 290° and 320°F (145° and 160°C).

Line bending or thermoforming ACRYLITE® mar resistant (MR) is not recommended. Cold forming is possible. To calculate the minimum radius of curvature, multiply the thickness of the sheet to be used by 330. Tighter radii may result in crazing or cracking of the coating.

Never heat ACRYLITE® in a kitchen oven. Acrylic sheet gives off highly flammable fumes when decomposed by overheating. These gases are potentially explosive if allowed to collect in an unventilated area.

Most kitchens ovens do not have accurate temperature control. Temperatures can be off as much as 75° (42°C), possibly allowing the acrylic to overheat.

And because air is not forcibly circulated in a standard kitchen oven, the fumes will accumulate. When they come into contact with the heat source, there is likely to be an explosion. Repeat: Do not heat acrylic in a kitchen oven.

Forming with a Strip Heater

A strip heater is without doubt the most useful acrylic-forming device in the home craftsman's arsenal. Used properly, it is perfectly safe. A correctly assembled strip heater will not exceed safe heat.

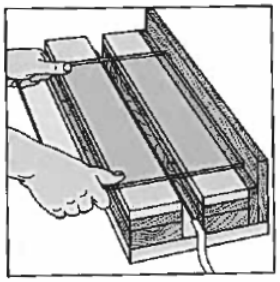
Unfortunately, a strip heater can only be used to form straight-line bends; but that is usually all that's necessary for most home projects. It will allow you to make those bends with a minimum of trouble—and a minimum of electricity.

A strip heater heats only the area to be formed—there's no need to heat the entire sheet if you only intend to make a straight-line bend. It heats quickly. And with a little care you'll get excellent results, because the rest of the piece stays cool.

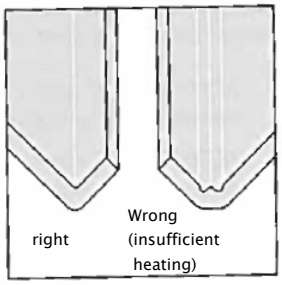
Strip heater kits with complete instructions are available from your ACRYLITE® sheet distributor.

Heating and forming ACRYLITE® with a strip heater is not difficult. When properly heated, the acrylic may be easily bent into smooth, clean corners. With patience and a little practice you should soon be able to achieve excellent results.

First, remove the masking paper from the line of the bend. The rest of the masking paper should be left in place to protect the unheated area. Then lay the sheet on the heater with the bend line directly above the exposed heating element so that the bend will be made away from the heated side. The length of heating time will vary according to the thickness of the sheet. ACRYLITE® thicker than 3/16" (4.5 mm) should be heated on both sides for a proper bend. Heat the sheet until it begins to sag at the bend line. Don't try to bend the sheet before it is fully heated, or after it has partially cooled. This will result in irregular and creased corners and high internal stress.

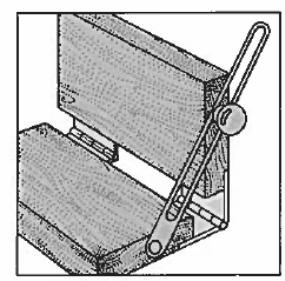


Heating acrylic sheet with a strip heater.

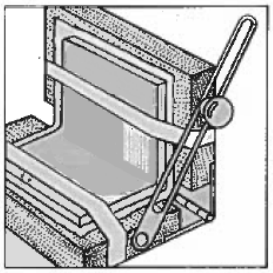


Correct and incorrect bends.

Forming jigs and clamps should be used for best results. They can be made of wood and used over and over. Make preformed jigs for certain angles, or even special shapes for individual projects. Variable angle jigs can be made with two pieces of wood hinged together and held at the desired angle with a variable brace, as shown. Felt, flannel, or flocked rubber should be used to line any surfaces that may come into contact with the heated acrylic. Wear heavy cotton gloves when handling heated ACRYLITE®. They'll protect your hands, as well as the sheet.



Hinged, variable-angle jig.



Right-angle forming with material taped in place.

Other Forming Techniques

ACRYLITE® sheet may be formed into almost any shape. However, specialized heating and forming equipment is usually required for all but the simplest projects. Furthermore, while many of the forms and jigs required for two and three dimensional forming can be easily made out of wood in the home shop, such projects are beyond the scope of this booklet. Many excellent books are available covering all types of acrylic forming. They deal with techniques such as drape forming, plug and ring forming, surface molding, blow and vacuum forming, and even design, construction, and use of ovens for heating acrylic sheet. Your ACRYLITE® distributor should have a selection of these books, and can recommend one that will suit your needs.

ACRYLITE® can be joined with solvent cements to form strong, durable, transparent joints.

ACRYLITE® mar resistant (MR) can be cemented on the non-coated sheet surfaces using the same procedures as ACRYLITE® extruded and ACRYLITE® cast. If solvent cementing on or to a coated surface

is necessary, the coating must first be removed by wet sanding with 500 grit, or finer, sandpaper.

The ingredients in most solvent cements are hazardous materials, and extreme care should be observed using proper ventilation and handling techniques as recommended by the manufacturer of these products. Always follow the manufacturer's recommendations and instructions when using these and any other products.

The ultimate strength and appearance of your joints will depend on how carefully you make them. Getting really good joints requires a lot of care, and considerable skill. Practice on scrap pieces. The more experience you have, the better your work will be.

Observe some basic precautions when working with acrylic solvents:

- Always work in a well-ventilated area.
- Do not smoke—solvents are highly volatile and flammable.
- Protect skin from contact with cement.
- Do not attempt to cement ACRYLITE® in temperatures under 60°F (15°C). Temperatures from 70° to 75°F (21° to 24°C) are ideal.
- Always follow the cement manufacturer's recommendations.

Preparation of the Joint

All surfaces that are to be joined should fit together accurately without having to be forced. Flat, straight surfaces are easiest to work with. Any area that is part of the original surface of the sheet should be left untouched.

A smooth cut made with a cooled power saw also should be left alone. However, if the area to be joined has a saw cut that is rough, it should be wet sanded or finished with a router to get a flat, square edge. Do not polish edges that are to be cemented. Polishing leaves a highly stressed, convex edge with rounded corners. It will make a very poor joint.

Always remove the masking from around the area to be joined.

Capillary Cementing

Capillary cementing is probably the most popular method of joining ACRYLITE®. It works because of the ability of low-viscosity solvent-type cement to flow through a joint area by capillary action. Properly done, it yields strong, perfectly transparent joints; however, it won't work at all if the parts do not fit together perfectly.

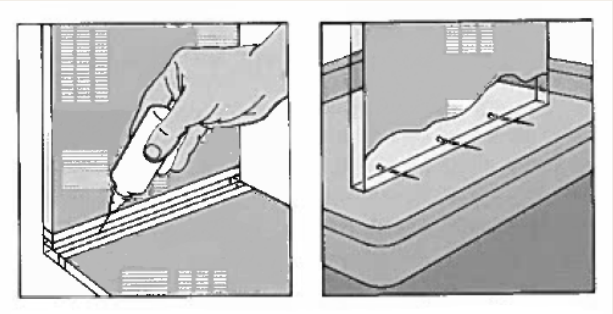
Visit www.acrifix.com for our complete line of specialty bonding agents.

First make sure the parts fit together properly. Then hold the pieces together using a jig that will support the pieces firmly but will permit slight movement as the joint dries.

It is important that the joint be kept in a horizontal plane, or the cement will run out of the joint. Apply the cement carefully along the entire joint. Apply it from the inside edge, whenever possible on a box-corner type joint, and from both sides, if possible, on a flat piece. A special needle-nozzled applicator bottle available from your ACRYLITE® Distributor is recommended.

If the cement does not flow completely into the joint, try tilting the vertical piece very slightly (about 1o) towards the outside. This should allow the solvent to flow freely into the entire joint.

Always let the joint dry thoroughly (usually 10-30 min.) before moving the part. Maximum bond strength will not be reached for 24 to 48 hours.



Capillary cementing. Apply solvent to inside edge.

Soak cementing. Material must be supported on pins or sire bards.

Dip or Soak Cementing

This method of cementing ACRYLITE® involves dipping the edge of one of the pieces to be joined directly into the solvent. It is very important that only the very edge be dipped. Exposing too much area to the solvent will result in a weak, slow-setting joint.

You'll need a shallow tray in which to dip the acrylic. The tray can be made of aluminum, stainless steel, galvanized steel, or glass. Do not use plastic— the solvent may dissolve it.

Place short pieces of wire, pins, or brads into the tray to keep the edge of the ACRYLITE® from touching the bottom of the tray. The tray must be level. Pour solvent cement into the tray so that it just covers all the brads—and covers them evenly.

Now carefully place the edge to be cemented into the tray so that it rests on the brads. You can hold the piece upright by hand, but it is better to use some kind of support to hold the piece in place while it soaks. A couple of padded clamps attached to the sheet, and resting on the edge of the tray are fine. Heavy pieces of wood placed against each side of the sheet will also work. Slotted wooden supports are usually used for production work, but anything that will hold the piece firmly upright is sufficient.

ACRYLITE® should be left in the solvent from 1/2 to 2 minutes, depending on the thickness of the sheet, the type of solvent used, and the bond strength required. Soaking time should be long enough to allow the edge of the sheet to swell into a "cushion."

As soon as an adequate cushion is formed, the piece must be removed. Hold it for a few seconds at a slight angle to allow the excess solvent to drain off. Then carefully, but quickly, place the soaked edge precisely into place on the other part to be joined. Hold the parts together for about 30 seconds without applying any pressure. This will allow the solvent to work on the surface of the other piece.

After 30 seconds you can apply some pressure to squeeze out any air bubbles. But be very careful not to squeeze out the cement.

When the pieces are joined, the part should be placed in a jig to maintain firm contact for 10 to 30 minutes. Do not allow the parts to move during this critical time. Allow the joint to set for another 8 to 24 hours before doing any further work on it.

Viscous Cementing

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

Apply the cement like glue with a brush, spatula, or directly from the applicator tube.

Remove the masking material from around the joint area, and carefully apply a small bead of cement to one side of the joint. Then gently join the pieces as described under "Soak Cementing."

Masking tape may be applied to protect the area around the joint, but it should be removed carefully after about 5 minutes, while the cement is still wet. Don't touch the parts at all for the first critical 3 minutes, or the joint will not hold. The part may be carefully moved after 30 minutes, but don't do any additional work on it for 12 to 24 hours.

For more information on Cementing, please refer to Technical Brief #8.

Glazing

ACRYLITE® sheet is lighter, more transparent, and far more break resistant than glass. Glazing with ACRYLITE® sheet is safe and easy.

Important: ACRYLITE® expands and contracts at a much greater rate than glass does. To compensate, remember to allow approximately 1/16" per running foot .52 cm per running meter) shorter than your frame size.

The sheet thickness you need depends on the size of your window. Use the chart below on page 13 to determine the proper thickness for each application.

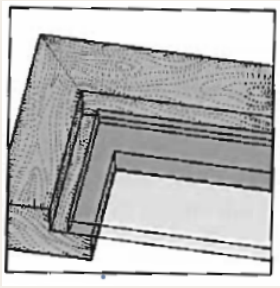
For windows smaller than 24" (600 mm), use an elastic glazing compound which is compatible with acrylic sheet. Your ACRYLITE® sheet distributor can recommend one.

For windows over 24" (600 mm), it is important that you select the proper rabbet depth to allow for expansion and contraction.

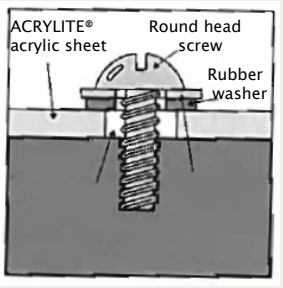
Use a continuous removable stop, and caulk with a polysulfide sealant or butyl tape.

If it is necessary to bolt a small panel [less than 24" x 24" (600 x 600 mm)] to a frame, drill mounting holes larger than the diameter of the bolts or screws. Use round-head screws, with rubber washers against the ACRYLITE®, and stainless steel washers against the screw head. After tightening, back off 1/2 turn. Do not use counter-sunk, flat-head screws. They will fracture the acrylic sheet.

Your ACRYLITE® sheet distributor can supply any glazing materials—and any additional information you may need to do the job right with ACRYLITE®.

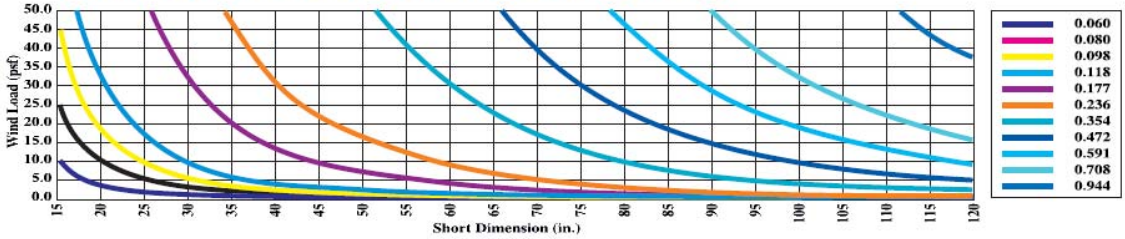


Proper rabbet depth and room for expansion.



Details for bolting small sheet to a frame.

Recommended Thickness for Vertical Glazing



	Length of Long Side (in feet)											
	up to 1	2	3	4	5	6	7	8	9	10	11	12
Clearance	1/16"	1/8"	3/16"	1/4"	5/16"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"
Rabbet Depth	1/2"	11/16"	1"	1 1/8"	1 1/2"	1 9/16"	1 5/8"	1 3/4"	1 13/16"	1 15/16"	2"	2 1/8"
Min. Width of Sealant Bead	1/4"	7/16"	5/8"	3/4"	1"	1 1/4"	1 3/8"	1 1/2"	1 3/4"	1 3/4"	1 3/4"	1 3/4"

** Assumptions: Glazing is installed at 60F with temperatures ranging from -20 to 120F. Glazing is installed in accordance with CYRO recommended thicknesses and clearances. Sealant with 50% movement capability is used.*

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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