

Sign Fabrication Manual For





Acrylite[®] SG

ACRYLIC SHEET



ACRYLITE[®] SG Sheet Sign Fabrication Manual

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INTRODUCTION

The introduction of ACRYLITE® SG acrylic sheet marks the development of a modified acrylic sheet designed specifically for use in the sign industry. ACRYLITE SG sheet was designed as the universal sign product. ACRYLITE SG sheet gives the sign fabricator a product with outstanding fabrication ease, excellent weatherability and additional impact strength. This manual provides recommendations to help the fabricator achieve optimum results with this unique product.

CUTTING OPERATIONS

Cutting With Table And Panel Saws

Generally, straight cuts are made using a conventional table or panel saw. A saw blade specifically designed for acrylic, such as a triple-chip grind, carbide toothed saw blade works best. For a 10 inch saw blade, 80 teeth are recommended. For larger blades, an equivalent tooth spacing can be utilized with good

results. On a triple-chip grind saw blade, every other tooth has a beveled cutting edge which aids in chip removal and reduces heat buildup.

When cutting ACRYLITE SG sheet, the blade should protrude 1/2" to 1" above the surface of the sheet, with optimum results usually obtained using a 3/4" blade height. Vibration should be kept to a minimum, either by clamping the sheet to the cutting surface (when operating a vertical saw or panel saw) or providing the proper pressure on a table saw.

Moderate feed rates, in the 15-25 ft/min range, will ensure a proper cut. A chipped edge indicates that the feed rate is too fast or that the material is vibrating too much, while a melted edge indicates that the feed rate is too slow. It is recommended that the feed rate be decreased at the end of the saw cut, especially on thinner sheets. This will prevent chipping and blow-out of the exit edge.

Jigsaw Cutting

Hand held jigsaws work well with ACRYLITE SG sheet in cutting intricate shapes and letters. Results comparable to those achieved with cell-cast acrylic sheet are possible. For best results, use a wavy-set type blade with 8-13 teeth/inch (tpi). This blade configuration will typically chip cell-cast acrylic, but will work very well with ACRYLITE SG sheet due to the sheet's inherent toughness. Using a blade with a higher number of teeth per inch, 18-24 tpi, may result in melting along the cut edge of ACRYLITE SG sheet. It is also important to ensure the blade is sharp – do not use a blade that has already been used for cutting metal or other materials.

In jigsaw cutting it is important to minimize vibration by clamping the material to a firm surface. Feed rates in the 8-12 ft/min range will yield the best results.



Panel saw cutting

Bandsaw Cutting

Bandsaws are typically used for quick, rough cuts, as well as intricate shapes and letters. As with jigsaw cutting, the quality of the edge is dependent on the type of blade used. Generally, blades in the raker style with teeth in the 8-13 tpi range will produce the best results.



Bandsaw cutting is easily accomplished with ACRYLITE SG sheet.

Blades with fewer teeth per inch will leave a jagged, rough edge while blades with a higher number of teeth per

inch will yield a smoother edge. If blades with more teeth per inch are used, it is recommended to utilize a coolant such as water, compressed air, or a combination of both to reduce melting along the cut edge.

Feed rates in the 10 to 15 ft/min range will yield the best edge.

Scribing and Breaking

ACRYLITE SG sheet can be scribed and broken similarly to ACRYLITE® FF sheet and ACRYLITE® GP acrylic sheet. Scribing should only be done on the 0.118" (3mm) thickness. With the aid of a straight edge to guide the scribing tool, pull the scribing tool across one side of the sheet surface several times until the tool has penetrated approximately 1/16" through the material. Next, position the sheet so that the scribed line is just beyond the edge of the working surface. While holding the sheet firmly in place on the surface near the scribed line, apply a quick, downward pressure to the end of the sheet overhanging the working surface.

ROUTING OPERATIONS

ACRYLITE SG sheet is a more forgiving material to rout than ACRYLITE FF sheet or ACRYLITE GP sheet. Due to its proprietary formulation, ACRYLITE SG sheet is less prone to chipping, and permits faster feed rates without sacrificing edge quality.

Handheld and Table Routers

Carbide tipped, 1/2" diameter bits, with two flutes will yield the best results. In all routing operations, from hand-routing to stationary equipment, minimizing sheet vibration will help to reduce or eliminate chipping. Vibration can be minimized by using sufficient hold-down for stationary routing and a guide when hand routing.

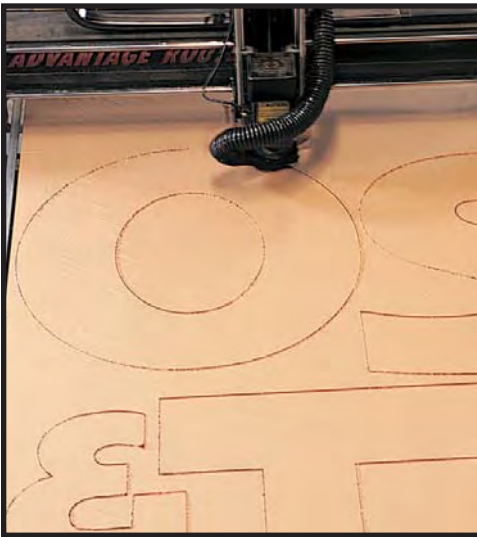
CNC Routing Machines

CNC routing is one of the best ways to increase productivity and assure reproducible results and quality.

When using a CNC router, a solid carbide "O" flute style router bit with one or two flutes works best in sizes from 1/8" to 1/2". One, two and three flute up spiral bits, 1/8" thru 1/2" in diameter are also recommended. These bits are less susceptible to friction and heat build up because of their ability to evacuate chips from the cutting area by pulling them up and out of the way.



Routing



Routing

Rotational speeds of 16,000 to 18,000 RPM's and feed rates of 100 to 300 in/min will produce the best results with 3/8" and 1/2" diameter bits.

For smaller bits rotational speeds of 18,000 to 20,000 RPM's with feed rates of 100 to 200 in/min range will produce the best edge and tool life.

It is important to note that dust/chip collection systems as well as coolants such as compressed air, mist coolants and cold air/vortex tube technology, will greatly reduce the heat build up and improve the quality of the edge and life of the tool.

DRILLING OPERATIONS

ACRYLITE SG sheet can be easily drilled with the same equipment used for ACRYLITE FF or ACRYLITE GP sheet. It is best to use stationary drilling equipment such as a drill press. The proprietary formulation of ACRYLITE SG sheet provides excellent resistance to chipping when drilling. In general, it will drill faster and more easily than standard acrylic sheet.

Best results are achieved using high-speed steel "modified-for-plastic" drill bits. Instead of the relatively flat tip angle of 120 degrees present in a standard metal drill bit, a modified-for-plastic drill bit should be ground to a sharp 60-90 degrees. The sharp angle allows the bit to easily enter and exit the material. The cutting edge should be ground flat to a 0-4 degree positive rake angle, which allows the cutting edge to scrape the material, not gouge it. The surface behind the cutting edge must be ground away to a

12-15 degree clearance angle, which minimizes metal to plastic contact and heat build-up. Rotational speeds in the 500-1000 RPM range, combined with feed rates in the 3-12 in/min range, will produce a clean, low-stress drill hole.

Proper backing material such as plywood or another piece of acrylic should be used when drilling ACRYLITE SG sheet. The backing material will help prevent chipping of the bottom surface. When drilling stacks of sheet, it is a good idea to utilize a coolant such as water or kerosene. This will minimize heat buildup and create holes with smooth walls. Slow feed rates should be used when entering and exiting the material to avoid chipping or blowout.

If a "modified-for-plastic" drill bit is not available, a standard metal drill bit can be used to produce satisfactory results. Under these circumstances it is extremely important to securely clamp the material to the table to minimize chipping.

EDGE FINISHING OPERATIONS

The same edge finishing operations that work well with standard acrylic sheet can be used to obtain excellent edge finishes with ACRYLITE SG sheet. However, care must be taken in certain edge finishing operations, such as flame polishing, to ensure the best edge quality. This section will cover proper techniques to ensure an edge finish of the highest quality.

Wet Sanding and Scraping

Wet sanding will yield a smooth, matte-finish edge and is suitable for use prior to flame polishing. Dry sanding is not recommended as it will lead to a highly stressed and melted edge. To obtain the smoothest edge, start with 240 grit "wet and dry" sand paper using plenty of water. The use of water will keep edge stresses to a minimum by acting as a coolant. Finer finishes can be obtained by sanding with 240 grit, then stepping up to 400, 600, and 800 grit, depending on the desired finish.

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The use of belt sanders may result in melting and high stress. If using a belt sander, it is important to use light pressure when sanding. Excessive pressure will increase frictional heat buildup causing the edge to melt and gum.

Hand scraping is an alternative to sanding for preparing the edges of a sheet for polishing. The sheet can be scraped with almost any type of sharp, flat metal edged tool. Holding the scraper vertically, at a 45 degree angle to the edge, scrape the sharp edge of the sheet by drawing the tool across the edge with firm but steady pressure. A continuous strip should peel as the tool is drawn along the edge. There are tools available that will reduce the sharpness of both edges at the same time. It is important to note that scraping will not provide the smoothness of a sanded or polished edge.

Jointing

Jointing of ACRYLITE SG sheet will produce a smooth, machined edge. Knives made from high-speed steel or carbide will work well. Blade height should be set to remove approximately 1/32" from the sheet. The most important aspect of jointing is controlling the feed rate. It is important to use a steady, even feed rate while holding the sheet material firmly to the guide fence. Excessive feed rates will result in a chipped, highly stressed edge.

Edge Finishing Machines

Commercially available edge finishing machines offer a fast method of obtaining smooth edges without sanding or scraping. Finishes will range from smooth, matte-finish to almost polished edges, depending on the design of the machine and cutting tools used. Edge finishing machines are ideal for preparing sheet for subsequent edge finishing steps, such as flame polishing and buffing, or fabrication

steps such as cementing. Care should be taken to adjust the feed rate to eliminate chipping and melting of the material. Fast feed rates will result in chipping while slow feed rates will result in melting. In general, faster feed rates can be used for edge finishing ACRYLITE SG sheet than for standard acrylic sheet.

Buffing

Buffing the edges of ACRYLITE SG sheet will produce a high luster finish. It is recommended that the edge be scraped, then wet sanded prior to buffing. A stationary buffing wheel or portable polishing head can be used. Loose stitched, bleached muslin wheels, used in combination with a medium to fine buffing compound will provide a high luster edge in a short time.

Flame Polishing

Highly polished edges can be obtained by flame polishing using the same techniques used with standard acrylic with slight modifications. When flame polishing ACRYLITE SG sheet, a cooler flame should be used than with standard acrylics. This is best accomplished using MAPP gas.

Another option is to use a hydrogen/oxygen welding torch. Make sure to reduce the oxygen content to produce a flame that is bright orange/red in color, as opposed to the bluish, almost invisible flame typically used with standard acrylics. ACRYLITE SG sheet has a tendency to turn a milky white color when overspray from the flame contacts the surface of the sheet. It is important to minimize this contact by using a quicker feed rate than would normally be used for standard acrylics. Hold the torch at an angle and draw the flame along the edge of the sheet. Practice will help you to estimate the speed and distance. If the first pass does not produce a completely polished edge, allow the piece to cool, then try a

second pass. For optimum edge finish, wet sand the edge or pass the sheet through an edge finishing machine or jointer to remove any tooling marks from previous operations prior to flame polishing.

face contact and air bubbles in the joint. **NOTE: Never cement flame polished edges. This operation creates high levels of internal stress in the material and could lead to crazing.**

Due to its formulation, ACRYLITE SG sheet tends to absorb more solvent cement than standard acrylic sheet. To compensate for this, make sure to apply a liberal amount of cement to the joint. This can be accomplished by tipping the vertical piece about 1 degree so that more cement flows into the joint. Alternatively, 0.002" shims can be used to elevate the vertical piece slightly. Shims should be removed after 45-60 seconds.



Cementing

CEMENTING OPERATIONS

ACRYLITE SG sheet can be easily and quickly cemented to itself, other acrylic materials, as well as to trim cap, creating strong bonds in applications such as channel letters. ACRYLITE SG sheet offers faster setup times than cell-cast acrylic sheet products. Acrylic cements such as Weld-On® #3, Weld-On® #5 or Acrifix® FF solvent cement work well on ACRYLITE SG sheet. Generally, techniques used to cement standard acrylics can be used with success on ACRYLITE SG sheet.

Trim Cap



Cementing

When making channel letters, make sure all areas are in contact with the trim-cap, and apply a generous amount of cement around the perimeter of the letter. For additional strength, a bead of viscous cement such as Weld-On® #16 can be applied to the perimeter of the letter.

Acrylic to Acrylic Joints

Edge finished, jointed, or clean saw-cut edges will yield the best results. Avoid cementing sanded or scraped edges because these operations tend to round the corners of the edge, leading to inconsistent sur-

Initial setup time will vary between 5-60 seconds, depending on the type of cement used and the shop environment. The following table illustrates the "tack" time for various cements. For this experiment, the "tack" time is defined as the amount of setup time required before a "T" joint can be picked up by hand without failure of the joint. The following recommendations apply to edge finished edges and should be used only as a guide.

Type Of Cement	Weld-On® #4	Weld-On® #5	Schwartz Rez-N-Glue® VC-1	MC Bond®	Acrifix® FF
Average Tack Time	6-8 Seconds	8-10 Seconds	>60 Seconds	8-10 Seconds	7-9 Seconds

For optimum strength, bonds should be allowed to set up for 10-15 minutes before moving, and 24 hours before subsequent fabrication steps are performed. High bond strength will be achieved after 24-48 hours, and bond strength will continue to increase for several weeks.

PAINTING OPERATIONS

ACRYLITE SG sheet can be easily painted and silk-screened using the same paints and techniques as ACRYLITE FF and ACRYLITE GP sheet products. However some paints, due to their brittleness, may result in lower overall impact strength. See the source of supply section in this manual or contact CYRO's Technical Service Department for additional information.

Surface Preparation

Paper masking may leave a latex residue on the sheet. This residue can result in poor wetting of the paint on the surface of the sheet and poor paint adhesion. If this is a problem, clean the surface of the sheet prior to painting using a dilute mixture (50% or less) of isopropyl alcohol in water. Rinse thoroughly with water and dry using a soft cloth or chamois.

Particles on the surface of the sheet can also cause adhesion problems. Therefore, it is important to remove dust and particles on the sheet surface by neutralizing static charge using an ionized air gun. Leaving

the masking on the sheet or using a removable spray-on maskant may help to minimize exposure to overspray.



Painting techniques typically used with acrylic and polycarbonate sheet can be used with ACRYLITE SG sheet.

Painting

It is important to note that the overall impact strength of a painted sheet may be lower than an unpainted sheet. This is due to the lower impact strength and tensile strength of the paint itself. The actual impact strength reduction will depend on the paint used. Refer to the source of supplies section of this manual or contact CYRO's Technical Service Department for additional information.

The following table illustrates the Gardner Impact values before and after painting.

Sheet Type	ACRYLITE SG acrylic sheet, non-painted surface	ACRYLITE SG acrylic sheet, painted using Lacryl® 400
Approximate Gardner Impact Value (inch-lbs.)	75	40

Paint Removal

Spray and screen paints can be removed using recommended paint removers. To reduce the chances of crazing the surface of the sheet, minimize the amount of time ACRYLITE SG sheet is in contact with these solvents.

Even with the complete removal of paint from the surface of the sheet, a phenomenon referred to as "ghosting" often occurs. A hazy outline of the original images may remain and become visible upon application of new paint.

THERMOFORMING OPERATIONS

ACRYLITE SG sheet can be thermoformed into a variety of finished parts and sign faces. Its forming temperature range of 270-350°F offers faster cycle times than can be achieved with conventional cell-cast acrylic sheet. This wide range of forming temperatures allows for greater versatility in thermoforming operations.

In most cases, excellent results can be achieved using forming temperatures of 310-320°F. (Up to a draw ratio of 3:1) Parts that contain more detail or have a deep draw need to be formed at the high end of the forming range, 320-350°F. Parts should be left in the mold after forming until they have reached a temperature of approximately 180°F. It is important to preheat the mold to approximately 160-180°F. If the mold is not preheated, the formed part will cool too quickly, resulting in internal stresses in the thermoformed part. Draft angles of 2-3 degrees will allow for easy part removal.

Due to its method of manufacture, ACRYLITE SG sheet will be oriented in the manufacturing direction. Manufacturing direction can be determined by looking at the label or printed masking on the sheet. As you read the label or masking, the manufacturing direction is from top to bottom. The sheet may shrink up to a maximum of 5% in the manufacturing direction when heated. Be sure to allow for shrinkage when cutting blanks for thermoforming.

During the heating cycle, colorless ACRYLITE SG sheet will turn a translucent white color. After the sheet is formed and allowed to cool to room temperature, it will regain its high light transmission, losing its milky white appearance.

Forming Cycles

ACRYLITE SG sheet can be heated by a variety of methods including infrared heaters, circulating air ovens, and other conventional heating methods. Generally, when heating ACRYLITE SG sheet in an air circulating oven, the heating times will be similar to ACRYLITE FF sheet. Heating cycles when using infrared heaters tend to be much shorter than oven heating cycles.

The following table illustrates approximate heating times for 0.118" (3 mm) ACRYLITE SG sheet. Testing was done on a thermoformer equipped with ceramic heaters positioned approximately 2.5 to 3 inches above the sheet.

Time	Approximate Temperature (F)
120 seconds	260°
180 seconds	310°
210 seconds	350°



Ideal thermoforming temperature is between 310 - 320°F. Many thermoformers judge readiness by the sag and the feel of the sheet.



Immediately after thermoforming, the sheet will appear a milky white color. Cooling cycles can be reduced by using cooling fans or applying compressed air.



The resulting sign will have excellent light transmission, clarity and mold definition.

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It is important to note that actual times will vary for each individual thermoformer due to various parameters such as the type of heater (convection oven, radiation, etc.), distance from the sheet, and single or dual side heating.

ACRYLITE SG sheet offers outstanding thermoforming definition at reduced cycle times, compared to standard acrylic and polycarbonate sheet. The following graph illustrates its typical performance.

As can be seen from the graph, ACRYLITE SG sheet offers excellent part definitions at temperatures lower than those of conventional cell-cast acrylic sheet and polycarbonate sheet.



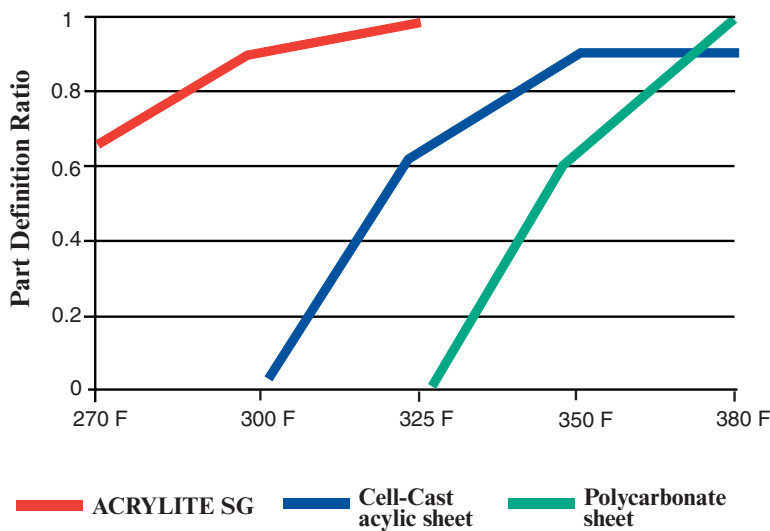
LINE BENDING OPERATIONS

ACRYLITE SG sheet can be easily line bent using standard bending equipment. Line bending should be performed when the core temperature of the sheet is in the range of 270-290°F, which is slightly lower than line bending temperatures for continuously manufactured or extruded acrylic sheet and much lower than line bending temperatures for cell-cast acrylic sheet. As a result, shorter cycle times can be expected with ACRYLITE SG sheet. It is important not to bend ACRYLITE SG sheet at temperatures lower than 270°F because this leads to high internal stresses. These internal stresses can lead to crazing of the material should it come in contact with incompatible solvents or aggressive chemicals.

As the temperature of the colorless ACRYLITE SG sheet rises, the material will turn a milky white color in the heated region. ACRYLITE SG sheet will return to its original colorless, high light transmitting state as it cools back down to room temperature.

ACRYLITE SG sheet has a manufacturing direction. This direction is identified by looking at the masking label. As you read the ACRYLITE SG sheet label from left to right, the manufacturing direction will run from top to bottom. On longer line bends, i.e. greater than 36 inches, a slight warp or bow across the sheet may be evident. This effect can be reduced by orienting the bend so that it is perpendicular to the manufacturing direction.

Plot of Part Definition vs. Temperature (F) Taxi-Cab Mold



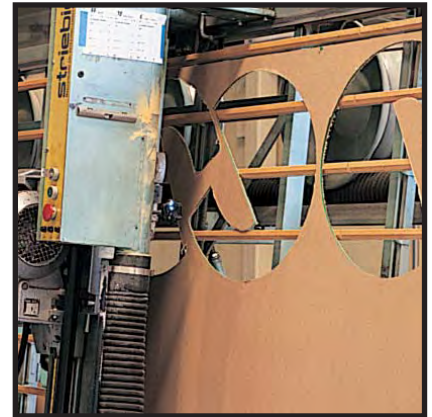


TROUBLE SHOOTING GUIDE CUTTING OPERATIONS

Problem	Possible Cause	Solution
Chipping	Excessive vibration	Ensure pieces are properly supported and clamped to working surface.
	Excessive blade run-out	Check blade collar, replace if run-out is greater than 0.002".
	Improper blade height	Set blade height at 1/2" to 1" above work pieces.
	Improper blade type	For table saw cutting, use a triple-chip blade. (2.5 teeth per inch of circumference) For jigsaw cutting, use a wavy-set style blade. (8-13 teeth per inch)
	Feed rate too fast	Decrease feed rate.
Melting	Dull blade	Replace or sharpen blade.
	Feed rate too slow	Increase feed rate.
	Improper blade style	For jigsaw cutting, use a wavy-style blade with 8 to 13 tpi. For all purpose table saw cutting, use a triple-chip, carbide tipped blade, 2.5 teeth per inch of circumference (i.e. 80 teeth for a 10 inch diameter blade).

TROUBLE SHOOTING GUIDE DRILLING OPERATIONS

Problem	Possible Cause	Solution
Chipping	Feed rate too fast	Use feed rates in the 3-12 ft/min range.
	Vibration	Ensure pieces are properly clamped to work surface.
	Incorrect bit	For best results, use a "modified-for-plastic" drill bit.
Blow out	Insufficient back support	Use backing material such as plywood or acrylic.
Melting	Feed rate too slow	Use moderate feed rates in 3-12 ft/min range.
	Rotational Speed too high	Reduce rotational speed. RPM's in the 500-1000 range will yield the best results.
	Inadequate cooling	Use air or water mist.
	Incorrect bit	Use a "modified-for-plastic" drill bit. Smaller bits may require cooling.
	Bit is not true	Replace bit.



TROUBLE SHOOTING GUIDE LINE BENDING OPERATIONS

Problem	Possible Cause	Solution
Bowing from a long bend	Uneven cooling of the bend	Make sure there is enough clearance to allow air circulation over the entire length of bend, including the underside.
		Design a reverse "bow" in the cooling jig.



TRUBLE SHOOTING GUIDE ROUTING OPERATIONS

Problem	Possible Cause	Solution
Bit Breakage	Excessive heat buildup in bit due to inadequate chip removal	Use compressed air to clear chips. Use bit designed for chip removal (twist up).
	Plow routing using fast feed rates	Reduce feed rate.
	Dull bit	Replace or sharpen bit.
	Excessive load on bit	Make multiple passes.
Melting	Feed rate too slow	Use faster feed rates.
	Dull bit	Replace or sharpen bit.
	Inadequate heat removal	Use a larger diameter bit.
		Use a coolant such as air or mist.
	Rotational speed too high.	Reduce RPM's. May need to be coupled with a faster feed rate.
	Inadequate chip removal	Use a twist-up bit. Use a slow helix angle rather than a fast helix angle. Consider multiple passes. Use compressed air to aid in chip removal.
Incorrect number of flutes on bit.	Decrease number of flutes on bit.	
Chipping	Feed rate too fast	Decrease feed rate.
	Vibration	Make sure pieces are adequately supported.
		Use a larger diameter bit and /or a bit with a shorter cutting length.
Incorrect number of flutes in bit	Increase the number of flutes on the bit.	

TRUBLE SHOOTING GUIDE EDGE FINISHING OPERATIONS

Problem	Possible Cause	Solution
Dull edge after flame polishing	Not enough heat/ missed spots	Allow piece to cool, then make another, slower pass to cover these areas. Ensure the edge is fully submersed in flame, but with minimum overspray onto the sheet.
Charred edge after flame polishing	Too much heat	Use MAPP or propane gas rather than Hydrogen/Oxygen mixture. If MAPP gas is unavailable and Hydrogen/Oxygen torch is used, make sure flame is bright red/orange rather than invisible blue.
	Dirt or contamination	Make sure edges of sheet are free from dirt or contamination prior to flame polishing.
Blisters on edge after flame polishing	Too much heat	See above for recommendations.
Rough Edge after buffing	Improper edge preparation	Make sure all tooling marks are removed by wet sanding or edge finishing prior to buffing.
Melting from edge finishing machine	Feed rate too slow	Increase feed rate.
Chipping from edge finishing machine	Feed rate too fast	Reduce feed rate.



TRUBLE SHOOTING GUIDE CEMENTING OPERATIONS

Problem	Possible Cause	Solution
Crazing	Cementing flame polished or buffed edges	Avoid cementing after these edge finishing steps.
Bubbles	Uneven edges, allowing air to flow into gap	Edge finish or rout edges prior to cementing.
	Premature weight application	Adjust timing of weight application so that the application of weights will not cause the cement to flow out of joint.
	Removing weights too soon	Allow longer cure time.
	Incorrect weights	Weights should be 1-2 lb per square inch of joint area.
	Cement applied too quickly	Make sure to stay behind the front of the cement stream. This will prevent gaps from forming in the joint.
Weak joint	Insufficient cure time	Allow part to setup for at least 15 minutes before moving and 24 hours before performing subsequent fabrication steps.
	Not enough cement in joint	Use an applicator with a larger diameter tip. Apply cement slowly to ensure joint is completely filled with cement. Tilt the piece slightly to allow cement to flow into the joint. Scrape one side of edge to allow cement to fill the joint better.
	Bad cement	Ensure cement is fresh and container is closed tightly when not in use.
Hazy joints	Humidity too high	Try another cement. Try to work in a less humid environment. Try adding acetic acid in small concentrations (3-5%) to slow the rate of evaporation of the cement.



TRUBLE SHOOTING GUIDE THERMOFORMING OPERATIONS



Problem	Possible Cause	Solution
Blistering	Surface temperature of the sheet is too high	Reduce heat time, oven temperature, or increase distance from sheet to heaters.
Inadequate part definition	Sheet temperature below optimum forming temperature	For high definition parts, heat to the higher end of the forming temperature i.e 320 - 350°F.

TRUBLE SHOOTING GUIDE PAINTING OPERATIONS

Problem	Possible Cause	Solution
Inadequate paint adhesion	Dust or other particles on surface of sheet	Remove particles prior to painting using an ionized air gun.
	Improper paint mixture	Make sure mixture is at the right proportions.
	Residue left on sheet from paper masking	Clean sheet using up to 50% IPA solution in water. Rinse thoroughly with water.
Ghosting or hazing effect	Use of incompatible paint remover	If using paint removers, make sure to minimize the contact time on the sheet.
Crazing	Incorrect paint	See recommended source of supply in this fabrication manual for approved paints.
	Paint contacted sheet in areas of high stress	Make sure sheets are fabricated with minimum stresses.



CLEANERS

210 Plastic Cleaner & Polish

Sumner Laboratories, Inc.
186 Lincoln St.
Boston, MA 02111
617-542-8656

CrystalClean

Discover Plastics
3700 Western Way, NE
Millersburg, OR 97231
541-926-2900
www.discoveryplastics.com

CUTTING

Table Saw Blades

Forrest Manufacturing Co.
461 River Rd.
Clifton, NJ 07014
800-733-7111

North American Products
1180 Wernsing Rd.
Jasper, IN 47546
800-634-TOOL
www.naptools.com

General Saw Corp.
2518 Andalusia Blvd.
Cape Coral, FL 33909
800-306-SAWS
www.gensawcorp@generalsaw.com

Band Saw Blades

Blackstone Industries, Inc.
The Olson Saw Co.
16 Stony Hill Rd.
Bethel, CT 06801
203-792-6882
www.blackstoneind.com

Jig Saw Blades

Local Hardware Store

SAWS

Table Saws

Porter Cable-Delta
4825 Highway 45 North
Jackson, TN 38302
800-438-2486
www.portercable.com

Powermatic and Jet Tools
WMH Tool Group
427 Sanford Rd.
Laverne, TN 37086
800-248-0144
www.wmhtoolgroup.com

Altendorf America
Div. of Stiles Machinery
3965 44th St.
Grand Rapids, MI 49512
616-698-7500
www.stilesmachinery.com

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512 Westinghouse Blvd.
Charlotte, NC 28273
704-587-3400
www.holzher.com

General International
514-326-1161
General Canada
835 Cherrier
Drummondville, Quebec
Canada J2B 5A8
819-472-1161
www.general.ca

Panel Saws

Plastisaw Systems
2950 Bay Vista Court
Benecia, CA 94510
707-746-6200
www.metlsaw.com

Schelling America, Inc.
301 Kitty Hawk Dr.
Morrisville, NC 27623
919-544-0430
www.schelling.com

Giben America, Inc.
3044 Northwoods Circle
Norcross, GA 30071
770-448-9140
www.giben.com

Laser Cutting

Laser Machining Co.
500 Laser Dr.
Somerset, WI 54025
715-247-3285
www.lasermachining.com

Universal Laser Systems, Inc.
16008 N. 81st St.
Scottsdale, AZ 85260
480-483-1214
www.ulsc.com

TSI Lumonics Corp.
8401 Jefferson Hwy.
Maple Grove, MN 55369
763-315-1780
www.lasermachining.com

DRILLING

Drill Bits – Plastic

FTM, Inc.
6160 Cobblestone Rd.
Placerville, CA 95667
530-626-1986
www.123ftm.com

American Tool Co., Inc.
92 Grant St.
Wilmington, OH 45177
937-235-3811
www.americantool.com

Craftics, Inc.
2701 N. Pulaski
Chicago, IL 60639
773-235-3307
www.craftics.com

Onsrud Cutter, Inc.
80 Liberty Dr.
Libertyville, IL 60048
847-362-1560
www.onsrud.com

Spade Bits, Hole Saws

Local Hardware Store
Woodworking Industry
Magazines

Circle Cutters

Stanley Tools (Div. Stanley
Works)
New Britain, CT 06053
800-648-7654
www.stanleytools.com

Countersinks

Weldon Brand
Sold through J&L Industrial
Supply
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ROUTING

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www.onsrud.com

Great Lakes Carbide Tool Mfg.
Inc.
101 N. Peshtigo Rd.
Peshtigo, WI 54157-0157
715-582-3883
www.glct.com

Paso Robles Carbide, Inc.
731-C Paso Robles St.
Paso Robles, CA 93446
805-238-6144
www.carbideshop.com

Wisconsin Knife Works
2505 Kennedy Dr.
Beloit, WI 53511
800-225-5959
www.wisconsinknifeworks.com

Toolmasters LLC
1400 Railroad Ave.
Rockford, IL 61104
815-968-0961
www.toolmastersllc.com

Trend Lines, Inc.
100 Justin Dr.
Chelsea, MA 02150
800-767-9999
www.getmetoolrewards.com

Woodworkers Supply
125 Jay Lane
Graham, NC 27253
800-645-9292
www.woodworker.com

ROUTERS

C.R. Onsrud, Inc.
Hwy. 21 South – Box 419
Troutman, NC 28166
704-528-4528
www.consrud.com

Thermwood Corp.
PO Box 436
Dale IN, 47523
800-533-6901
www.thermwood.com

Gerber Scientific Products, Inc.
83 Gerber Rd.
So. Windsor, CT 06074
800-222-7446
www.gspinc.com

MULTICAM
8920 West Royal Lane
Irving, TX 75063
972-929-4070
www.multicam.com

KOMO Machine, Inc.
11 Industrial Blvd.
Sauk Rapids, MN 56379
800-643-5089
www.komo.com

EDGE & SURFACE FINISHING

Buffing Equipment

Delta International
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Memphis, TN 38118
800-223-7278
www.internationaltool.com

Buffing Wheels & Belts

Edward H. Best & Co.
1076 Washington St.
Hanover, MA 02339
781-826-0291
www.edwardhbest.com

Jackson Lea Mfg. Co.
121 Mattatuck Heights
Waterbury, CT 06705
203-753-5116
www.jacksonlea.com

Buffing Compounds

Matchless Metal Polish Co.
801 E. Linden Ave.
Linden, NJ 07036
908-862-7300
www.matchlessmetal.com

Jackson Lea Mfg. Co.
121 Mattatuck Heights
Waterbury, CT 06705
203-753-5116
www.jacksonlea.com

Torch Equipment

Smith Equipment
2601 Lockheed Ave.
Watertown, SD 57201
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www.smithequipment.com

National Torches & Tips by
Premier Industries
980 Osborne Rd. NE
Fridley, MN 55432
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www.nationaltorch.com

Edge Finishers

Blackstone Industries
Edge Finisher Corp.
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Bethel, CT 06801
203-796-7923
www.blackstoneind.com

BERMAQ, S.A.
American Woodworking
Equipment Dist. Corp.
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3635 Martin Farm Rd.
Suwanne, GA 30024-0973
770-831-9800

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6266 Taylor Rd.
Naples, FL 34109-1896
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www.pelicanwire.com

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Edge Finisher Corp.
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Bethel, CT 06801
203-796-7923
www.blackstoneind.com

C.R. Clarke & Co.
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Celebration, FL 34747
407-566-0755
www.crclarke.com

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6160 Cobblestone Rd.
Placerville, CA 95667
530-626-1986
www.123ftm.com

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Solvent Cements

Weld-On #3, #4, #5, (#16 viscous)
IPS Corp.
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www.ipscorp.com

ACRIFIX® FF

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800-631-5384
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Paints & Inks

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716 So. Columbus Ave.
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www.spraylat.com

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Spraylat Corp.
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Mt. Vernon, NY 10550
914-699-3030
www.spraylat.com

Paint Removers

206-T Cleaner/Remover
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Spraylat Corp.
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Mt. Vernon, NY 10550
914-699-3030
www.spraylat.com

Trim Cap

Wagner Zip-Change, Inc.
3100 Hirsch St.
Melrose Park, IL 60160
800-323-0744

Films

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THERMOFORMING

Thermoformers

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Beaverton, MI 48612
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www.brown-machine.com

Plasti-Vac, Inc.
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Charlotte, NC 38225
800-438-4139
www.plastivac.com

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440-439-1480

Temperature Sensitive Tape

Paper Thermometer Co.
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Greenfield, NH 03047
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www.paperthermometer.com

Ovens

The Grieve Corp.
500 Hart Rd.
Round Lake, IL 60073
847-546-8225
www.grievecorp.com

Trent, Inc.
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Philadelphia, PA 19127
215-482-5000
www.trentheat.com

Despatch Industries
63 St. Anthony Parkway
Minneapolis, MN 55418
612-781-5363
www.despatch.com

MAAC Machine, Inc.
590 Tower Blvd.
Carol Stream, IL 60188
800-588-MAAC
www.maacmachinery.com

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Wagner Zip-Change, Inc.
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Melrose Park, IL 60160
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www.wagnerzip.com

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Castle Rock, CO 80104
303-688-3966
www.magnetsource.com



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