



PLASKOLITE MIRROR SHEET

FABRICATION MANUAL

PLASKOLITE, INC.

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Plaskolite's products are strong, lightweight thermoplastic materials that have developed a wide use as a replacement for glass mirror, especially where the risk of higher stresses is greater, and where safety is a concern. Plaskolite mirrors can be used as a reflecting surface in decoration, visual merchandising and store design, and frees creative designers from the esthetic and physical limitations of ordinary glass. The following outline should acquaint you with the procedural information necessary to fabricate acrylic, polycarbonate, and PETG mirror sheets into useful products.

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DO'S AND DONT'S

1. Because acrylic has a relatively soft surface and is flexible, some imperfections or distortions may occur. It should not be used for precise image reflection. An appropriate thickness should be determined well in advance of cutting.
2. Acrylic mirror can not be thermoformed but can be cold formed.
3. Some adhesives attack the mirrored surface. Please test expendable pieces at least 72 hours in advance to determine suitability.
4. Mirror products are not recommended for glazing or any outdoor applications.
5. Acrylics tend to absorb moisture. High humidity levels may cause temporary warpage to the material. The warpage is characteristic of the material and should be considered in the design of the product or application.
6. Solvent gluing at edges may cause crazing.
7. Plaskolite acrylic sheet is a combustible thermoplastic. Precautions should be used to protect the material from flames and high heat sources.
8. Acrylic mirror can not be die cut, but can be router, saw, or laser cut.
9. Materials should be stored in a cool, dry area. Acrylic sheets will warp if exposed to variable temperatures. Changing humidity levels cause the greatest variation. Material should be stored flat and overwrapped with plastic to minimize absorption of water vapor.
10. Overage is provided for your convenience. Check peripheral areas for suitability before cutting.
11. Protective masking should not be removed until fabrication is complete. Exercise care during fabrication and handling of both sides of mirror.
12. Do not remask adhesive or paper masking on see-thru or first surface sheet. If required, mask over supplied film.
13. Do not use in shower doors, window applications or rooms where humidity could cause the thermoplastic sheet to expand or contract.
14. These suggestions and data are based on information we believe to be reliable. They are offered in good faith, but without guarantee, as conditions and methods of use are beyond our control. We recommend that the prospective user determine the suitability of our materials and suggestions before adopting them on a commercial scale.

ABOUT OUR PRODUCTS

ACRYLIC MIRROR SHEETS:

The most popular lightweight and flexible mirror substrate available in the widest range of thicknesses, colors and sizes. Acrylic mirror may be saw cut, router cut, or laser cut.

PETG MIRROR SHEETS:

Higher impact strength than acrylic mirror. Can easily be cold formed, die cut, or punched. These processes are suitable for high volume. Available in thinner gauges than acrylic.

POLYCARBONATE MIRROR SHEETS:

Recommended for applications requiring high impact strength, heat and flame resistance. The optics of Polycarbonate is comparable to acrylic, but its strength is 30 times stronger.

ARMADILLO(AR) COATING:

In-house processing offers an abrasion, solvent and stain resistant coating on acrylic and polycarbonate one or two sides, mirrored or non-mirrored. Increases and enhances the versatility of the substrate.

SEE-THRU MIRROR (TWO-WAY MIRROR):

A semi transparent reflective coating for monitoring or surveillance. Available in acrylic clear and colors and polycarbonate clear and colors.

FIRST SURFACE MIRROR:

An opaque, two-sided mirror used where a reflection in two directions is desired.

FABBACK®:

A gray paint backing on all of our mirrored sheet products. This backing is the most durable, toughest, scratch-resistant backing in the acrylic mirror industry.

ABM:

Adhesive backed mirror. This is used to mount mirror sheet to another substrate or surface. It is a white paper backing that transfers an adhesive on the sheet once the white paper is pulled off. This replaces adhesives applied by hand that can cause messy edges and non-uniform adhesive coverage.

PAPERMASK:

White or brown papermask, available as additional protection over the Fabback® backing for ease of handling, fabrication and working with mirror sheet.

PRODUCT ADVANTAGES OF PLASKOLITE MIRRORED ACRYLIC

Reflectivity	Approximately 85-90% over the 400-700 nanometer visual light spectrum.
Lightweight	Less than one half the weight of glass in the same size and thickness.
Break Resistance	Can be ten times more break resistant and has seventeen times greater impact resistance than glass of equal thickness.
Heat	Will tolerate continuous service up to 160° F, and can withstand occasional short-term exposure up to 190° F.
Easy Fabrication	Various shapes and sizes can be obtained by cutting with conventional power saws and routers, using the proper blades and cutters. Mirrored acrylic can be cold bent for curved shapes or strip heated for a sharp bend. State-of-art laser systems can produce accurate, complex designs.
Extensive Product Line	Available in .060 to .236 thickness. 19 standard colors with custom colors available. Also available in see-thru, first surface and textures.
Economical	Low fabrication and installation costs.
Quality	Highly reflective surfaces for use in display, decoration, or other mirror applications.

HANDLING / MAINTENANCE / CLEANING

HANDLING

All Plaskolite mirrored sheets are furnished with a protective masking on the top side of the sheet. Do not slide Plaskolite mirrored sheets when transporting. The masking should be left on the sheet during storage and fabrication to prevent damage. Plaskolite mirror is shipped in "ready-to-store" condition. Keep away from excessive heat, paint overspray and vapors from solvents and other chemicals. The materials should be stored in a clean, dry, and warm area with the original packing intact. However, this is not always practical as all or part of the shipment must be unpackaged for the customer to use. In these cases, the following guidelines should be followed:

- Vertical Storage:** If the mirror sheets are to be stored on end, care must be taken to avoid warping. Sheets must stand with an angle of no more than 10° from the vertical. A-frame racks made of plywood can be made to give full support to the materials.
- Horizontal Storage:** If the acrylic mirror is to be stored flat, care must be taken to avoid warping, slipping and scratching. If different sizes are to be stored together, make sure the largest pieces are at the bottom, the smallest on top. This will prevent overhang which can lead to warping and slipping during movement. Preventing chips or dirt from settling between the sheets will reduce the risk of scratching if a slip occurs, or while unpacking. Pallets are packaged with a heavy poly overwrap which protects the sheet from dirt and moisture. The overwrap should be intact during storage.

MAINTENANCE

- Masking:** Each mirrored product is well protected by a durable paint backing and a removable masking on the front. This masking should remain in place to protect the sheets during all phases of fabrication and installation. Plaskolite plastic sheets should be handled mirror side down, with the masking left on. Care should be taken not to slide sheets against each other.
- Removing Masking:** If there is difficulty in removing the masking, use aliphatic naphtha, kerosene, or distilled alcohol to moisten the adhesive. Do not use other chemicals or sharp objects to remove the masking.

CLEANING

- Washing:** Use a mild soap and a damp soft cloth to wipe the surface of the sheet with light pressure, avoiding the edges of the sheet. To remove grease, oil, or tar deposits on the material, use hexane or kerosene to remove them. Do not use any chemicals on a painted print design. Do not use window cleaning sprays, kitchen scouring compounds, or other chemicals to clean mirrored sheets.
- Polishing:** A surface gloss can be maintained by occasionally using a flannel cloth and good plastic cleanser or polish, such as Johnson's Pledge. Follow the instructions for polishing on the container.
- Removing Scratches:** Fine scratches can be removed by hand polishing with a plastic scratch remover or compound cleaner. Remove all residue and polish with a flannel cloth. Deep scratches need to be lightly sanded, using a 400 grit "wet or dry" sandpaper.

CUTTING

- Scribing And Breaking:** This method is used to achieve a quick, straight line cut of single sheets of Plaskolite acrylic mirror less than 3mm thick. Mark the line to be scribed (scored) on the Plaskolite mirror with a commercial scribe. Firmly place a straight edge along the line and use it as a guideline for the scribe or knife. Scribe the mirror along the line using several firm, evenly pressured strokes. Then, overhand the end of the mirror off the work table. Break the Plaskolite mirror with sharp downward pressure.*
- Circular Table And Panel Saw Cutting:** These saws are used to achieve a precise, straight line cut of one or more sheets of Plaskolite mirror. Because vibration is minimal, this method of cutting is recommended. The best way to avoid vibration and unwanted runout is to install a stiffener 1/2 to 2/3 the saw blade diameter and mount it against the outside of the blade. To prevent back cutting, the saw arbor, the saw table and the table fence must be properly aligned. Also, the throat plate (table kerf) must be kept to a minimum. A 10", 80 tooth carbide tipped blade is recommended for all-purpose cutting. The blade's teeth should be the triple-chip design, where every other tooth has a beveled cutting edge to help clear away saw chips,. For best results, the teeth should have a clearance angle of 10 to 15". **Material should be cut with masked side down.** Any paper interleaf should be kept intact between sheets to protect paint back coat during cutting. Use enough power to make the needed cuts, using a smooth and even feed rate. Uneven feed rates may produce gumming or chipping of the Plaskolite mirror.*
- Saber Saw Cutting:** Saber saws are generally used for cuts involving a frequent change in direction. Maintaining adequate support is important to prevent vibration which may cause chipping. To achieve this, clamp a straight board on the sheet near the cutting line. This may also be used as a saw guide. Set the saw to full speed before cutting the Plaskolite mirror. Without feeding too fast, press the saw shoe firmly against the mirror while cutting." Blades for saber saws should have at least 14 teeth per inch.
- Jig Saw Cutting:** Jig saws should be used primarily for inside cuts and intricate letters. Since the stroke is short, the blade heats up quickly and tends to soften and fuse the Plaskolite mirror. To avoid this, use a fast and steady feed rate." Blades for jig saws should have at least 14 teeth per inch.
- Band Saw Cutting:** Band saws are used for cutting curved sections or trimming thermoformed parts." Blades for band saws should have at least 10 teeth per inch.
- Laser Cutting:** Lasers may be used to cut virtually any image on a Plaskolite mirror with minimal material waste. The CO² laser operates by focusing a large amount of energy on a small defined area and melting and vaporizing the material. It produces a clean, polished edge without any saw chips. An average of 200 inches per minute may be accomplished by using about 200 watts from a 1200 watt laser. Annealing the sheet is recommended after cutting, especially when cementing is anticipated. Caution: lasers can create stresses along cut areas. Be sure to use a test piece before fabrication.

*CAUTION: A cool air mist should be in contact with the blades of all cutting devices before and during penetration of the plastic.

ROUTING

Many routers are available for use in the fabrication process. The router should have a minimum of one horse-power and a no load speed of about 20,000 RPM. Routers are normally used with a single or double fluted bit, but may consist of one to four flutes. Router bits can be carbide tipped, high-speed steel, solid carbide, or diamond tipped. They may be one piece piloted, non-piloted, straight cutting, multiple part, forming or speciality bits."

Hand Routing: A hand router is generally used when making a prototype or a replacement part, by using a precut template pattern clamped to the Plaskolite mirror, the hand held router may be smoothly guided around the pattern. Move clamps whenever necessary."

Circle Routing: A circle router would be used when a 360° piece of Plaskolite mirror is needed."

Pin Routing: Pin routers are very flexible. A double-backed tape or vacuum holds the mirror in place. Using the mounted overarm router to hold the cutter over a guide pin in the table, feed the mirror and pattern into the cutter and rotate 360° to form finished product."

Contour Routing: By using a contour jig on a pin routing machine, multiple parts can be manufactured. Cut the desired pattern on the base of the jig to follow the base guide pin. To secure several Plaskolite mirrors at one time, clamps should be mounted on the top of the work. Be sure to raise and lower clamp holders as necessary when the jig is rotated."

Computerized Numerical Control (CNC) Routing: CNC routers are used in the manufacture of high volume production. This type of router is designed for maximum use of the Plaskolite mirror. Mirrors may be designed for stacking which eliminates much of the waste normally produced."

Direction of Travel: This router is designed to rotate counterclockwise for external cuts, and clockwise for routing the inside edges of the Plaskolite mirror. When properly fed in the direction necessary, a smooth cut will result.

When operating a router, several precautions are necessary to avoid mistakes to the Plaskolite mirror or the tool in use. First routers are designed with a small diameter and must be operated at high speeds. Avoid vibrations, even the slightest vibration can cause crazing and fractures in the Plaskolite mirror during routing. Second, watch RPM speeds, higher RPM rates allow for faster feeding of the Plaskolite mirror, resulting in a smoother finish. Recommended RPM speeds are 18,000 to 28,000 RPM. Third, for maximum production, operate the feed rate just below chipping speed. Do not overload the motor. Fourth, maintaining a sharp cutter is very important to avoid chipping and decreased production. Finally, use a 1/2" or larger diameter cutter whenever possible, this larger diameter provides a better surface with less tendency to chip."

***CAUTION:** A cool air mist should be in contact with the blades of all cutting devices before and during penetration of the plastic.

DRILLING

Plaskolite mirror may be easily drilled with any commercial power-driven drill available. Included are: Portable drills, drill presses, lathes, or automatic multiple-spindle drilling units.

Before drilling a hole in a Plaskolite mirror, it is recommended to use a bit offered especially for plastics. If a drill bit for plastics is not available, a metal-working drill bit with a high -speed twist may be used with some modification.

Since metal-working drill bits are designed to push through metal the following modifications must be made to ensure no chipping or other damage to the Plaskolite mirror:

1. The tip angle is usually about 120° , this is too flat to cut through Plaskolite mirror products without damage and must be ground to a sharp angle of $60-90^{\circ}$ to allow the bit to enter and exit easily without chipping.
2. The cutting edge must be ground to a rake angle of $0-4^{\circ}$. This "flat" cutting edge will scrape the Plaskolite mirror without gouging it.
3. The surface behind the cutting edge must be ground away to clearance angles of $12-15^{\circ}$. This will allow back relief for reduced metal to plastic contact and heat build up.

Drill bits with tips larger than $5/8$ " should be ground to a point to reduce the amount of force required to start a hole. Drill bits must be true, or melting, burning and chipping may occur. Correctly modified drill bits will create two continuous spiral strips as the bit passes evenly through the Plaskolite mirror, when operated at the proper speed.

When drilling the actual Plaskolite mirror it would be wise to back up the surface with a durable surface, such as plywood, so the drill bit will continue into a solid material, this will prevent chipping on the opposite side of the Plaskolite mirror. A slow feed rate should be used when the bit enters or exits the Plaskolite mirror.

Holes of 1" or more may be cut with a circle cutter. To accommodate the material properties of Plaskolite mirror, the cutter bit must be modified so the tip scrapes the material without gouging it. Use a cool air mist system to avoid heat build up, leaving the walls of the hole with a smoother cutting edge. Use a drill press for uniform pressure and constant vertical positioning.

***CAUTION:** A cool air mist should be in contact with the blades of all cutting devices before during penetration of the plastic.

EDGE AND SURFACE FINISHING

The extent of finishing needed to produce a smooth, transparent edge is based upon the quality of the cutting tool used to machine the edge. A properly designed cutting tool with a sharp cutter will reduce the amount of finishing needed. Finishing is also reduced when a spray coolant is used along with the cutting tool to reduce excess heat build-up.

Polishing: A polished edge is the best possible finished edge, but requires the most preparation. Prior sanding is necessary if the edge is shaped from a saw-cut, sanding is not necessary when there is a well milled edge. A jointer, shaper, or hand-scraped edge can be used in place of sanding. A stationary polishing head produces the best polished surface. Bleached muslin wheels with a diameter of 8" to 14" with bias strips is recommended. This gives the buffing wheel a pleated appearance, and runs cooler than a stitched buffing wheel design and will also do a fast job.

Polishing Compounds: The finished quality of the polished edge is determined by the polishing compound used. To produce a high luster finish, the use of a fast cutting compound first will remove all sanding marks, followed by a high luster compound for the final buffing. To achieve a fairly good finish in one operation, a medium cutting compound would be best.

Polishing Surface: Prior sanding is not necessary when the scratches or machining marks are not too deep. A surface polishing wheel should be from 6" to 12" in diameter, built up to a width for 1 1/2" to 2". For the initial polish, use a soft, bleached muslin wheel, followed by a soft flannel wheel for the finishing.

Depending on the depth of the scratches, use a medium-course polishing compound or a fine compound.

Be sure to keep the Plaskolite mirror in motion at all times during the polishing procedure.

CHEMICAL RESISTANCE

Like all plastic materials, Plaskolite mirrored acrylic will react when exposed to many chemicals. Below is a partial list of chemicals known to react with Plaskolite acrylic mirror, exposure to them should be avoided, Factors such as fabrication stresses, exposure to loads or changing temperatures and the method of application can all influence the possible reaction. In all cases, care should be taken with dry chemicals or solvents used near Plaskolite mirrored acrylic.

KNOWN CHEMICALS THAT ATTACK PLASKOLITE MIRRORED ACRYLIC:

BENZENE	ETHYL ALCOHOL
LACQUER THINNERS	KETONES
ESTERS	METHYL ALCOHOL
CARBON TETRACHLORIDE	ETHERS
TOLUENE	

WEATHER RESISTANCE

Mirror products are not recommended for exterior use. If used outside, seal perimeter with silicon sealant to keep moisture out and protect mirror paint backing. Salt spray can also begin to degrade mirror.

CEMENTING

Mirrored acrylic is a reflective film applied to a substrate. When the substrate is affixed to another surface, both of these materials will in time conform to the irregularities of the supporting surface. A non-smooth, non-planar surface will cause localized bending of the mirrored sheet and distortion in the reflected image.

For best results, mirrored sheets should be mounted to a smooth, rigid, sturdy flat backing such as 5/8" or 3/4" plywood. The surface should be coated with a high quality paint or sealant to cover pockets and seal out moisture. The entire surface should then be covered with a mastic or another type of pressure sensitive adhesive.

Solvent cementing of a mirror sheet with a hard-coated surface is not readily accomplishable due to the chemical resistance of the coating.

Another option is to drill oversized holes in the mirrored acrylic and hold it to the wall using screw fasteners. Do not over tighten the screw fasteners. Over tightening will cause dimpling and distortion.

Visual distortion is a function of viewing distance and material thickness. A thicker piece of material will be less flexible and therefore maintain better optical integrity. Correct installation and sufficient material thickness can reduce visual distortion but may not completely eliminate it.

Ceiling and overhead installations are not recommended unless the mirrored acrylic is mounted in edge-engaging frames such as T-bar suspended ceiling frames or mechanical mounting.

Some adhesives may contain solvents such as toluene, ketones and hexane that can attack the backcoat. Adhesives with solvents of 5% or more are not recommended. Since numerous adhesives, cements, and mastics are available, they should be tested on expendable pieces prior to application. All tests should be applied at least 72 hours in advance to determine compatibility to the backcoat, the reflective coating and the acrylic itself. The following companies manufacture adhesives that are suggested for use with Plaskolite mirror:

Gunther Mirror Mastics

South Bend, IN
Phone# 800-227-6181
Products:
Premier
Pro-Mastic

Palmer Products Corporation

Louisville, KY
Phone# 800-431-6151
Products:
Mirro-Mastic

3M

St. Paul MN
Phone# 800-362-3550
Products:
Fastbond #4323
9500 PC Double Coated Polyester Tape
VHB Tape

Again we stress, before using any adhesives, cements, or mastics, please test expendable samples for at least 72 hours to determine suitability.

MIRROR BENDING

Line or strip bending is best accomplished by applying an intense narrow band of heat approximately 3mm away from the mirror substrate. 1.15mm nichrome (nickle-chrome) resistance wire is a commonly used heating element.

- Place the mirror face toward the heating element. Do not attempt to heat the paint side. Doing so will prolong heating times and cause blushing, a dulling of the mirrors reflective finish.
- Adjust your power source so that the wire becomes a medium to bright red color.
- Peel all masking several inches away from the bend area. Masking left in place, either poly or paper, will increase heating time and yield poor results.
- Acrylic will become bendable at 143 degrees C to 163 degrees C. Bending should be done at the coldest possible temperature requiring gentle force to make the bend. 3mm mirror should become pliable enough to bend within 20 to 25 seconds.
- Timing is critical. Under heating will cause warpage along the bend line and undue stress which may lead to cracking. Overheating will cause blushing.
- Cooling should be done as quickly as possible by air circulation.

FLAMMABILITY INFORMATION

Acrylic mirrored sheet is a combustible thermoplastic. Precautions normally used to protect wood and other combustibles from flame and high heat, should be observed with this material. It is recommended that appropriate building codes be followed to ensure proper and safe use.

IMPORTANT NOTICE: Careless handling of the product can result in injury. The same precautions should be exercised when using acrylic mirror that are taken when fabricating glass, plastic, or wood to prevent accident or ingestion.

CONSULTATION & ADVICE

Our toll free number gives you access to a responsible person who has many years of experience working with mirrored acrylic in a multitude of varied applications. We cannot guarantee that we will always have a solution to a particular problem, but our working knowledge is quite extensive and available to you without cost.

Cutting To Size: Cost Savings can sometimes be realized by using our "in house" cutting services. We have both the skilled people and precision equipment to meet your needs. Whether it is with our two large circular saws or our small, more personal, table saw, we can provide our customers with the exact materials they need.

Laser Cutting: For accurate, complex cutting, lasers have an advantage over traditional saw or router cutting. Clean lines, safe smooth edges and varied patterns contribute to the design attractiveness of the finished piece.

This manual is a general guide for working with PLASKOLITE FABBACK® acrylic mirror, polycarbonate and PETG mirror sheet products. Because actual results vary with differences in operating conditions, thickness, color and composition of the mirror sheet, nothing contained herein can be construed as a warranty that PLASKOLITE'S mirrors will perform in accordance with these general guidelines.

Importance Notice: Our recommendations, if any, for the use of this product are based on tests believed to be reliable. The greatest care is exercised in the selection of raw materials and in the manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty expressed or implied is made as to such use or effects incidental to such use, handling or possession of the results to be obtained, whether in accordance with the directions or claimed so to be. The manufacturer expressly disclaims responsibility therefore. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use.

Anyone experiencing problems with fabricating PLASKOLITE'S mirror sheet products, should refer those questions to the Inside Sales Department at 1-800-848-9124.

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