



Mirrorworld Acrylic Fabrication Guide

Product Advantages of Mirrorworld Mirrored Acrylic

Reflectivity	Approximately 85-90% over the 400-700 nanometre 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 (71C), and can withstand occasional short-term exposure up to 190°F (87.7C).
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-the-art laser systems can produce accurate, complex designs.
Gauge	Available in 3mm and 6mm thickness
Product Line	Also available in Two Way (also known as See-Thru or one way mirror)
Economical	Low fabrication and installation cost.
Quality	High reflective surface for use in display, decoration or other mirror applications.

Do's and Don'ts

1. Because acrylic has a relatively soft surface and is flexible, some imperfections or distortion may occur. It should not be used for precise image reflection. An appropriate thickness should be determined well in advance cutting.
2. Acrylic mirror cannot be thermoformed.
3. Some adhesives attack the mirrored surface therefore use Mirrorworld supplied or suitably tested adhesive.
4. Do not use two way mirror for glazing or any outdoor application.
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. Mirrorworld acrylic sheet is a combustible thermoplastic. Precautions should be used to protect the material from flames and high heat sources.
8. Acrylic mirror cannot 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, storage, and applications conditions. Changing humidity levels cause the greatest variation. Materials should be stored flat and over wrapped with plastic to minimise absorption of water vapour.
10. Protective masking should not be removed until fabrication is complete. Exercise care during fabrication and handling of both sides of mirror.
11. Do not use in shower doors, window applications or rooms where humidity could cause the thermoplastic sheet to expand or contract.

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.

Handling

All Mirrorworld mirrored sheets are furnished with a protective masking on the top side of the sheet. Do not slide Mirrorworld Mirrored sheets when transporting. The masking should be left on the sheet during storage and fabrication to prevent damage. Mirrorworld mirror is shipped in "ready to store" condition. Keep away from excessive heat, paint over spray and vapours from solvents and other chemicals. The materials should be stored in a clean, dry and warm area with the original packaging intact. However, this is not always practical as all or part of the shipment must be unpacked 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 degrees 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 dirt from settling between the sheets will reduce the risk of scratching if a slip occurs, or while unpacking. Pallets are packages with a heavy poly over wrap, which protects the sheet from dirt and moisture. The over wrap should be intact during storage.

Masking: Each mirrored product is well protected by a durable paint backing and a removable masking on the front. This mask should remain in place to protect the sheets during all phases of fabrication and installation. Mirrorworld 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.

Washing: Use mild dish soap, water and a soft cloth to wipe the surface, apply only light pressure. To remove grease, oil or tar deposits on the material, use hexane, kerosene or aliphatic naphtha 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 a 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 Mirrorworld acrylic mirror less than 3 mm thick. Mark the line to be scribed (scored) on the Mirrorworld 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, overhang the end of the mirror off the worktable. Break the Mirrorworld mirror with a 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 Mirrorworld mirror. Because vibration is minimal, this method of cutting is recommended. The best way to avoid vibration and unwanted run out is to install a stiffener 1/2 to 2/3 of 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 degrees. Material should be cut with masked side down. 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 Mirrorworld mirror.*

Saber Saw Cutting: Saber saws are generally used for cuts involving 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 Mirrorworld mirror. Without feeding too fast, press the saw shoe firmly against the mirror while cutting. * Blades for saber saws should have at least fourteen 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 Mirrorworld mirror. To avoid this, use a fast and steady feed rate. * Blades for jig saws should have at least fourteen 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 Mirrorworld mirror with minimal material waste. The CO2 laser operates by focusing a large amount of energy on a small, defined area and melting and vaporising 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 specialty bits. *

Hand Routing: A hand router is generally used when making a prototype or a replacement part, by using a pre-cut template pattern clamped to the Mirrorworld 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 Mirrorworld 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 Mirrorworld 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. *

Computerised 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 Mirrorworld mirror. Mirrors may be designed for stacking, which eliminates much of the waste normally produced. *

Direction of Travel

The router is designed to rotate anticlockwise for external cuts, and clockwise for routing the inside edges of the Mirrorworld 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 Mirrorworld 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 Mirrorworld mirror during routing. Second, watch RPM speeds, higher RPM rates allow for faster feeding of the Mirrorworld 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 fewer tendencies 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

Mirrorworld 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 Mirrorworld 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 metalworking drill bits are designed to push through metal, the following modifications must be made to ensure no chipping or other damage to the Mirrorworld mirror.

1. The *tip* angle is usually about 120 degrees, this is too flat to cut through Mirrorworld mirror products without damage and must be ground to a sharp angle of 60-90 degrees 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°. This 'flat' cutting edge will scrape the Mirrorworld mirror without gouging it.
3. The *surface* behind the cutting edge must be ground away to clearance angles of 12-15°. 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 Mirrorworld mirror, when operated at the proper speed. When drilling the actual Mirrorworld mirror, it would be wise to back up the surface with a durable surface, such as plywood, so the drill bit will continue in to a solid material, this will prevent chipping on the opposite side of the Mirrorworld mirror. A slow feed rate should be used when the bit enters or exits the Mirrorworld mirror. Holes of 1" or more may be cut with a circle cutter. To accommodate the material properties of Mirrorworld 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 pressure and constant vertical positioning.
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Chemical Resistance

Like all plastic materials, Mirrorworld mirrored acrylic will react when exposed to many chemicals. Below is a partial list of chemicals known to react with Mirrorworld 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 Mirrorworld mirrored acrylic.

Known Chemicals That Affect Plaskolite Mirrored Acrylic

BENZINE ETHYL, ALCOHOL, LACQUER, THINNERS, KETONES, ESTERS, METHYL ALCOHOL, CARBON TETRACHLORIDE, ETHERS AND TOLUENE

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.

NOTE: ALL 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 OF OUR PRODUCTS ARE BEYOND OUR CONTROL. WE RECOMMEND THAT THE PROSPECTIVE USER DETERMINE THE SUITABILITY OF ACRYLIC MIRROR, AND SUGGESTIONS FOR USE, BEFORE ADOPTING THEM ON A COMMERCIAL SCALE.