

CELL-CAST ACRYLIC SHEETS

USER MANUAL



GAREN

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STORAGE

GAREN Acrylic Sheet is a slow combustion material, however, all preventive measures must be taken to avoid fire hazard.

GAREN Acrylic Sheet is a thermoplastic material, so it should not be stored near heat sources, to prevent it from being deformed. Contact with solvent vapors should also be avoided, as it is attacked by some of them.

The GAREN Acrylic Sheet should be stored in a vertical position on slightly inclined easels, which support the surface of the sheets, in order to keep them flat.

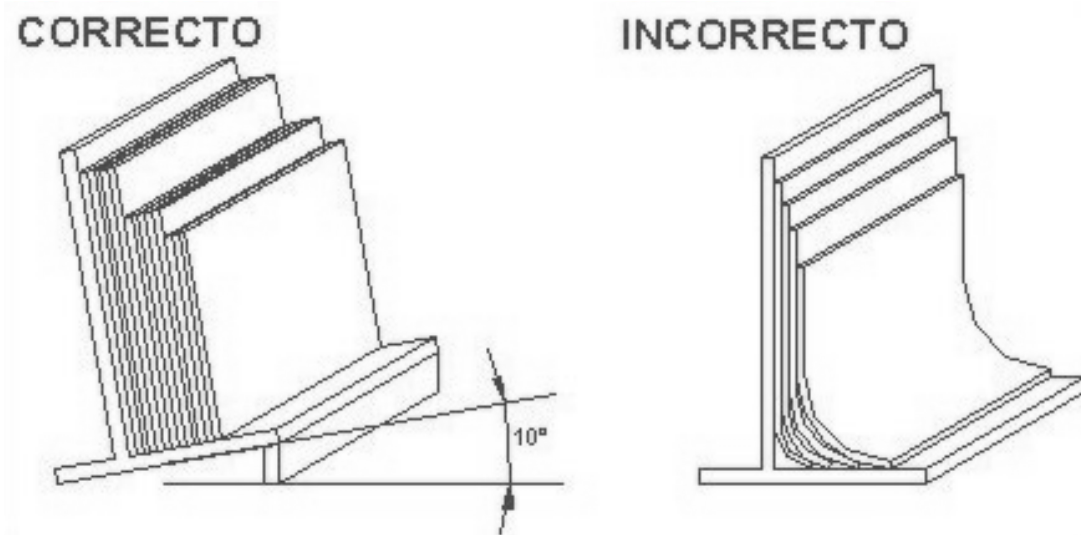


Fig. 1.1 How to storage acrylic sheet

GAREN Acrylic Sheet can be cut, machined, glued, painted and printed very easily, using the same techniques commonly used. More details are given throughout this information.

CUT

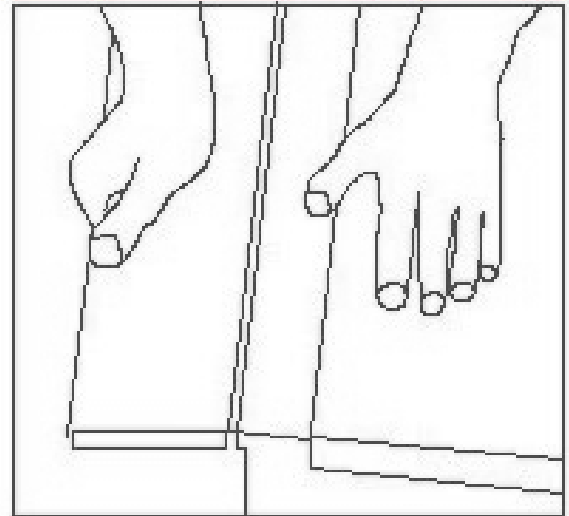
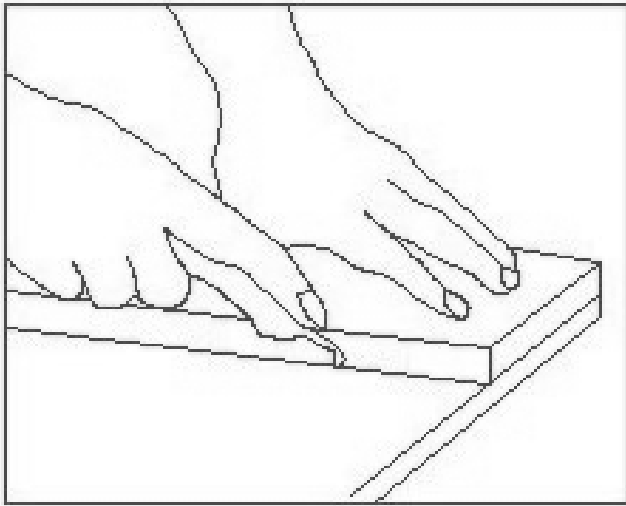


Fig.2.1How to cut the acrylic sheet

The GAREN Sheet can be cut, perforated, scraped, engraved and machined with conventional techniques and equipment, however, to prevent excessive heat accumulation it is advisable to take care of the cutting speed and remove the plastic waste when cutting or drilling one or several sheets.

For cutting it, circular saw, belt saw, hand saw, router cutting and laser cutting are used.

2.1.-Straight Cut – Circular saw

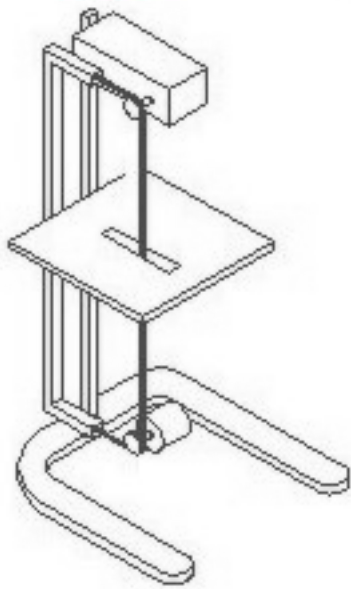
This is mostly used for linear cutting. Long life saws are commonly used. Some recommendations for the saw and the cut are the following:

Saw Diameter	Width	Teeth	R.P. M. Recommended	Saw Speed	Advance Rate
150-130 mm.	2.6-3.0 mm.	2.5-3.0 /Pulg.	3000-5000 r.p.m.	2400-3600 m/min.	3-7 m/min.

The diameter of the saw should be larger the greater the thickness to be cut.

If the advance rate is too fast the edge will seem "nibbled" if it is too slow the material may melt.

2.2.-Curved Cut-Belt Saw



It is used for moderate curves and trimming of the already molded product. Compared to the circular saw, the cutting edge and speed are not so good. The recommended conditions are the following:

Thickness	Teeth	Saw Speed
1.5-3 mm	14/pulg.	1,500 m/min.
4-10 mm	10 /pulg.	1,000 m/min.
13-30 mm	6/ pulg.	700 m/min.

Fig.2.2Belt Saw,Used to cut Acrylic Sheet

2.3.-Cut with power Saw

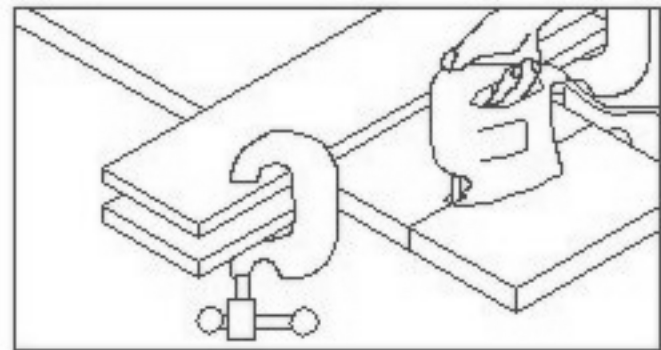
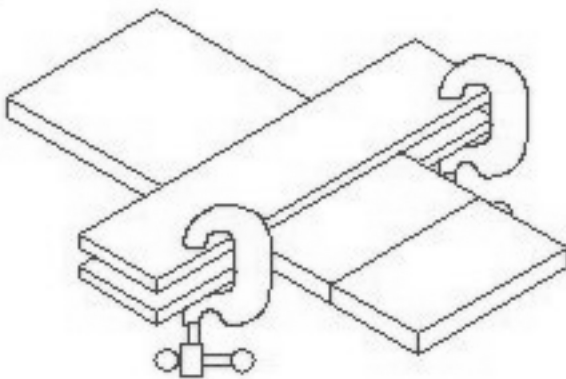


Fig.2.3Acrylic Sheet cut, Using a Hand Saw

The machine itself is compact and portable, with the advantage that it can easily make curved cuts and it is necessary to give clean appearance to the cut.

2.4.-Cut with Router

This is used to finish the curved cut, and in general to process the non-uniform edges. Comparatively this is the most efficient method to give a fine finish. To cut larger quantities of the same products there are automatic routers available in the market.



Fig.2.4CNC Router

2.5.-Cut with Laser

This is very efficient cutting and leaving the edges of the cut of very good quality. Automation is possible but the equipment is somewhat expensive. Due to the heating caused by this type of cut an internal tension is generated near the area of the cut that can cause cracking when this part is glued or coated.



Fig.2.5Laser cut machine

DRILLING

If you use the portable electric drill, the following values are recommended for this operation:

Angle θ	120°-140°	
Angle δ	10°-20°	
Feeding speed	60-300 mm/min.	
Operation R.P.M. for different diameters	2mm.	2000-4000 r.p.m.
	6mm.	1000-2000 r.p.m.
	13mm.	500-1000 r.p.m.
	20mm.	300 r.p.m.

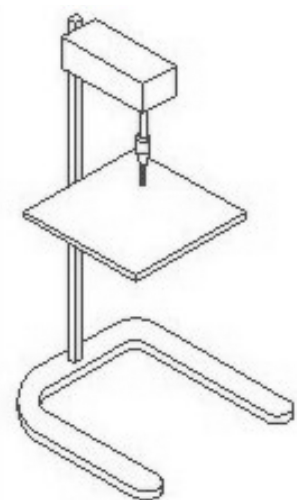


Fig.3.1Drilling an Acrylic sheet

Although heat transmission is small, heat buildup in a section can easily occur. The temperature increase should be kept under control either by air blow or dripping. The feeding speed must be maintained, so as not to cause a bad finish or not to generate softening due to low speed. The cutting chip starts heat generation and hinders cooling, so when the desired hole is deep, frequent cleaning of the drill is necessary.

MACHINING

GAREN Acrylic sheet is an extremely versatile material that allows turning, milling, brushing and so on. The following recommendations should be taken into account:

1. Firmly stabilize the product to be processed to avoid deformation during the process.
2. Pay attention to the quality of the machine and if the tool is sharp.
3. Select the appropriate feed rate.
4. Keep both the processed parts and the machine constantly with cooling.
5. Always clean the dust and machining chips.

POLISH

When the surface is rough, for example the edge of the cut by the saw, sand the surface to make it smooth. When sanding, use # 600 ~ # 1500 water sandpaper in rough to fine graduation. Finish polishing with the abrasive using a soft cloth. The finish can be done by polishing gently.

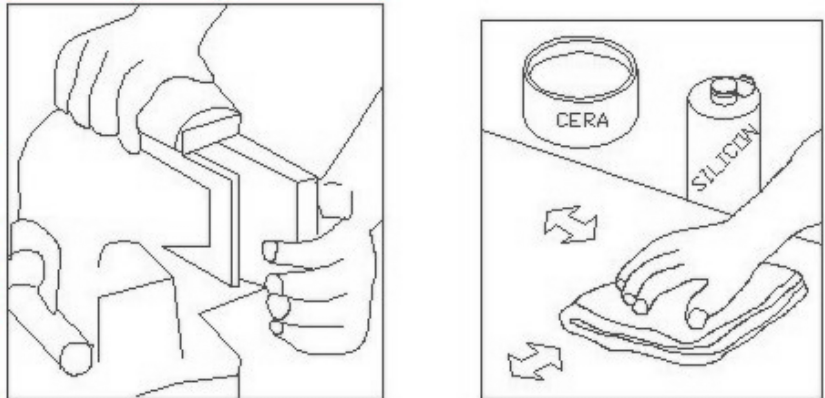


Fig.5.1 Polishing Acrylic Sheet, Using abrasive paper

The polishing speed is approximately 1,100 ~ 1,400 RPM (the speed of the polisher should be 700 ~ 1,500m / min.), being careful with the applied pressure. If the polishing speed is too high or if the polishing is done in a single section, distortions can be generated or seemed stained. The stripes are removed according to their depth, sanding and polishing or polishing only.

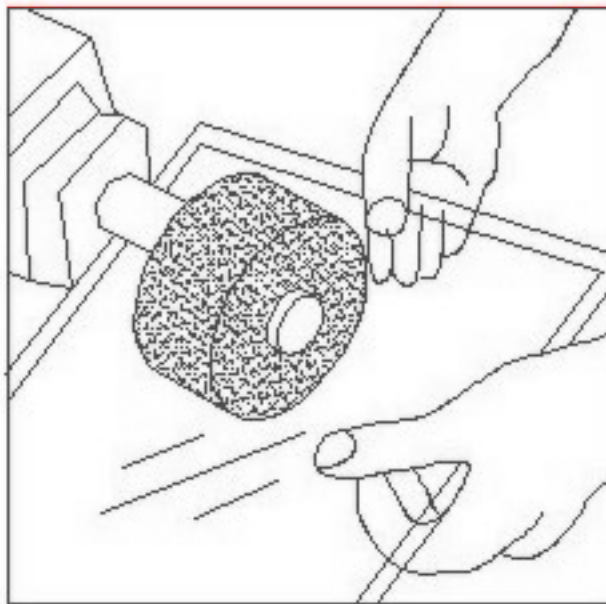
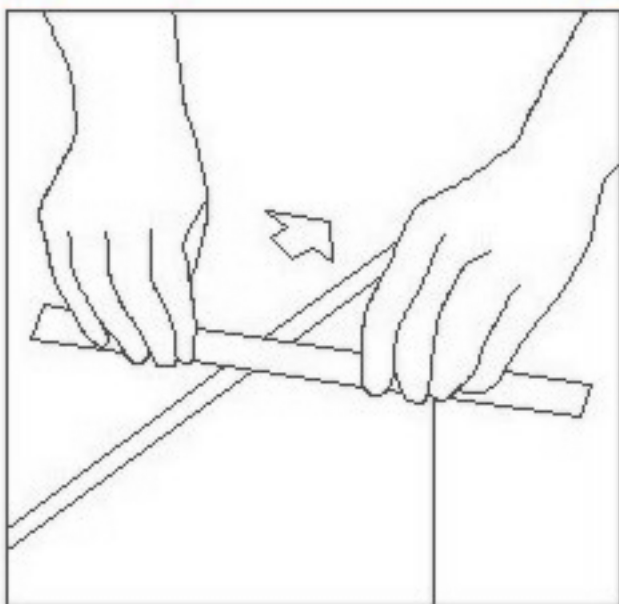


Fig.5.2 Polishing Acrylic Sheet, Using polisher

FLAME POLISHING

Hydrogen and oxygen are mixed, through a small nozzle. The flame is used for polishing, when the surface is semi-smooth. This technique is very efficient for polishing the edge of the sheet. Before flame polishing, the rough surface must be brushed or sanded.

The flame advance rate should be about 6m / min., the slower the advance, the polishing is more uniform.

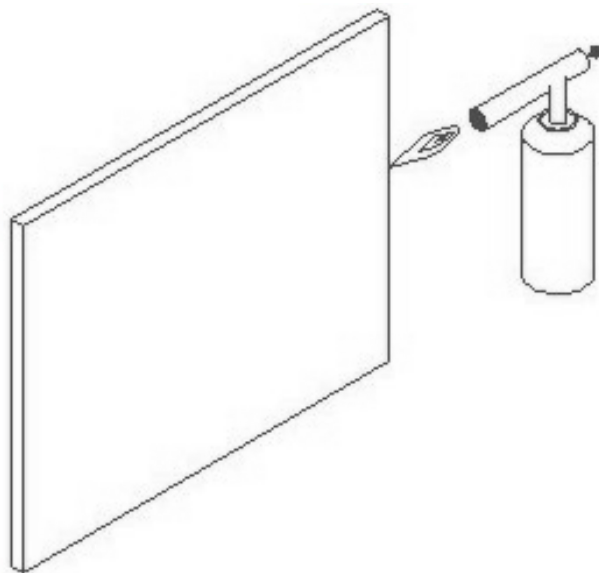


Fig. 6.1 Puliendo Lámina Acrílica, Utilizando Flama de hidrógeno.

But if the speed is too low it can bubble. Because there is still internal tension in the flame polished area, cracks may appear if the edge is glued or painted.

GLUED

The GAREN Acrylic sheet can be easily glued with the appropriate organic solvent or with polymerization adhesives. The following bonding techniques can be used:

Type 1 Solvent:

- Methylene chloride, or mixture of methylene dichloride and glacial acetic acid.
- Adhesion is extremely easy and the bonding speed is very high.
- The adhesive strength and durability if the product is going to be outdoors are not highly recommended.

Type 2 Solvent + Polymer:

- To the previous solvent, add a small amount of GAREN sheet chips allowing them to dissolve.

Type 3 Adhesive + Catalyzer:

- Catalyst is added to the partially polymerized methyl methacrylate.
- Bonding is done during polymerization and firm bonding is achieved but the glue should be prepared whenever required.
- The time for application is limited and the bonding time is long.

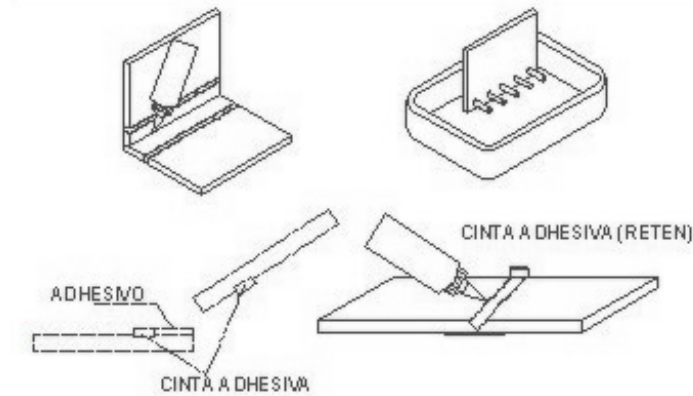


Fig. 7.1 How to glue an Acrylic Sheet

The following are some recommendations that should be observed for good adhesion.

- Protect the pieces with adhesive tape, to prevent the glue from adhering to the pieces with the exception of the area to be joined.
- Thoroughly clean the surface to be joined.
- For gluing type 1 use a hypodermic syringe
- For gluing type 2 you can use a brush or dropper.
- For gluing type 3, pour the glue directly into the gap, using a thin nozzle bottle. For the latter type, cover the upper surface with adhesive tape to prevent oxygen from delaying polymerization.
- Do not move the piece until it is firmly attached. All solvent residues should evaporate sufficiently after gluing.
- Always work in a well ventilated area.

Some issues that may arise while gluing are the following, here are some ways to avoid them:

CRACKING:

- It happens when during the previous phases of piece preparation internal tension has been generated and these come in contact with the glue.

BUBBLES:

- Parts do not seat properly on the surface.
- The adhesive or solvent evaporates too quickly.
- Bad glue injection.
- Low bonding pressure.
- Glue polymerization occurs too fast.

Bubble defects can be attributed to the above causes. The evaporation rate can be controlled by changing the ratio of the mixture of methylene chloride and ethylene dichloride, and also mixing high temperature boiling solvents to methylene dichloride.

CLOUDING:

When the temperature is high, some parts of the solvent tend to present clouding due to the condensation of the steam that occurs with the evaporation of the solvent. This can be avoided by reducing the evaporation rate. It is also effective to add a small amount of the high boiling temperature solvent (5 ~ 15 %) for example glacial acetic acid.

FORMING

In comparison with other acrylic sheets, GARENSheets are easily formed. The GAREN sheets can be heated through resistances, air oven and infrared oven.

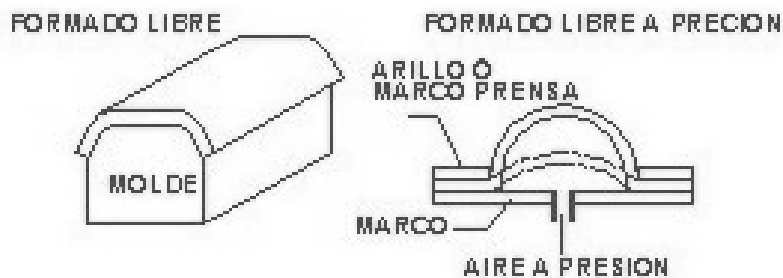


Fig.8.1 Two ways to Mold Acrylic Sheet

Because GAREN acrylic has a good thickness tolerance, heat disperses evenly throughout the sheet and excellent results are obtained in the forming. Conventional thermoforming equipment can be used as well as the forming techniques normally employed.

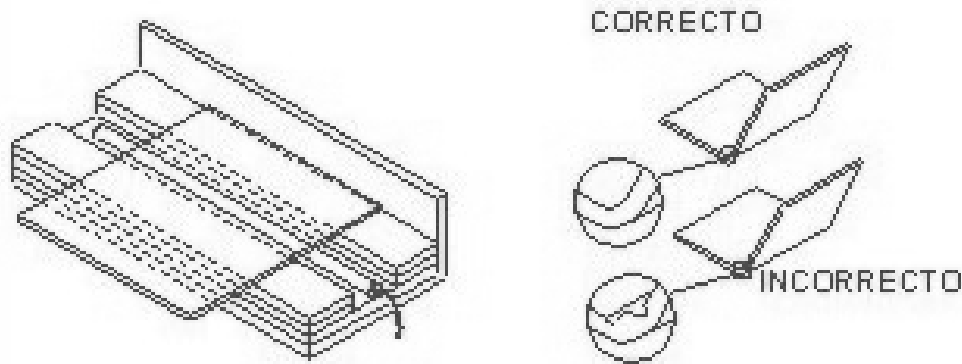


Fig. 8.2 Verify that the formed is correct

The recommended forming temperature rates for the GAREN sheet are 140-185C (275F~347F).

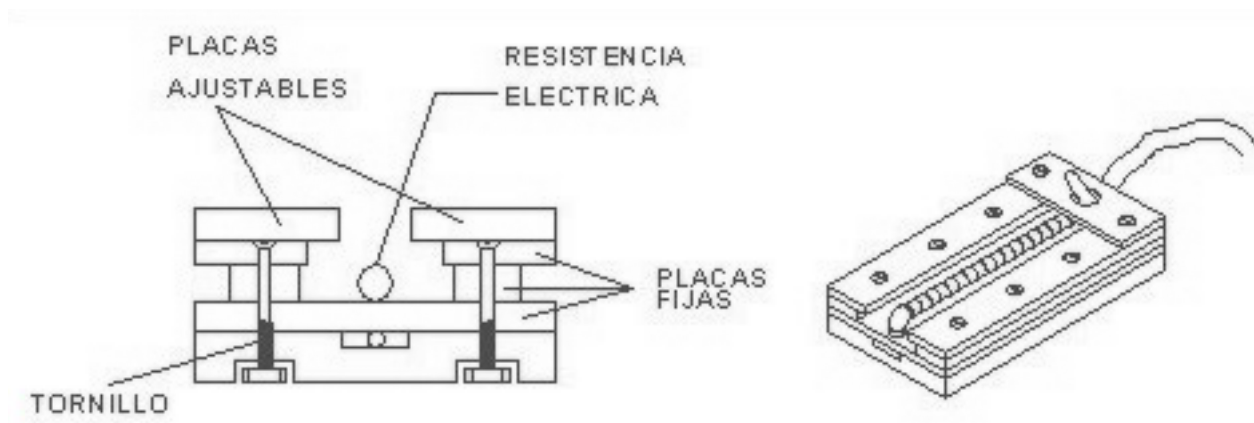


Fig. 8.3 Resistance pattern for Thermo-Formed

The GAREN acrylic sheet can be formed in almost any figure, since it takes the form of the mold by copying the folds and marks with great fidelity, keeping them when it cools for the calculation of the final dimension of the formed piece, it should be taken into account the shrinkage suffered by the piece formed in relation to the mold in which it was thermoformed. Below are shown a wide range of forming techniques:

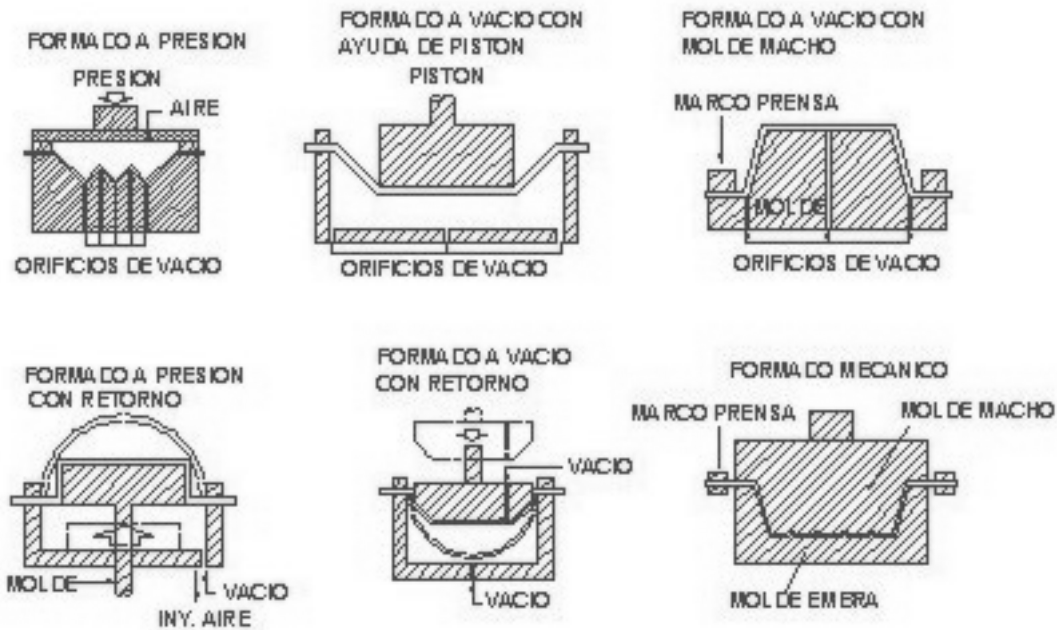


Fig. 8.4 Acrylic Sheet Formed techniques

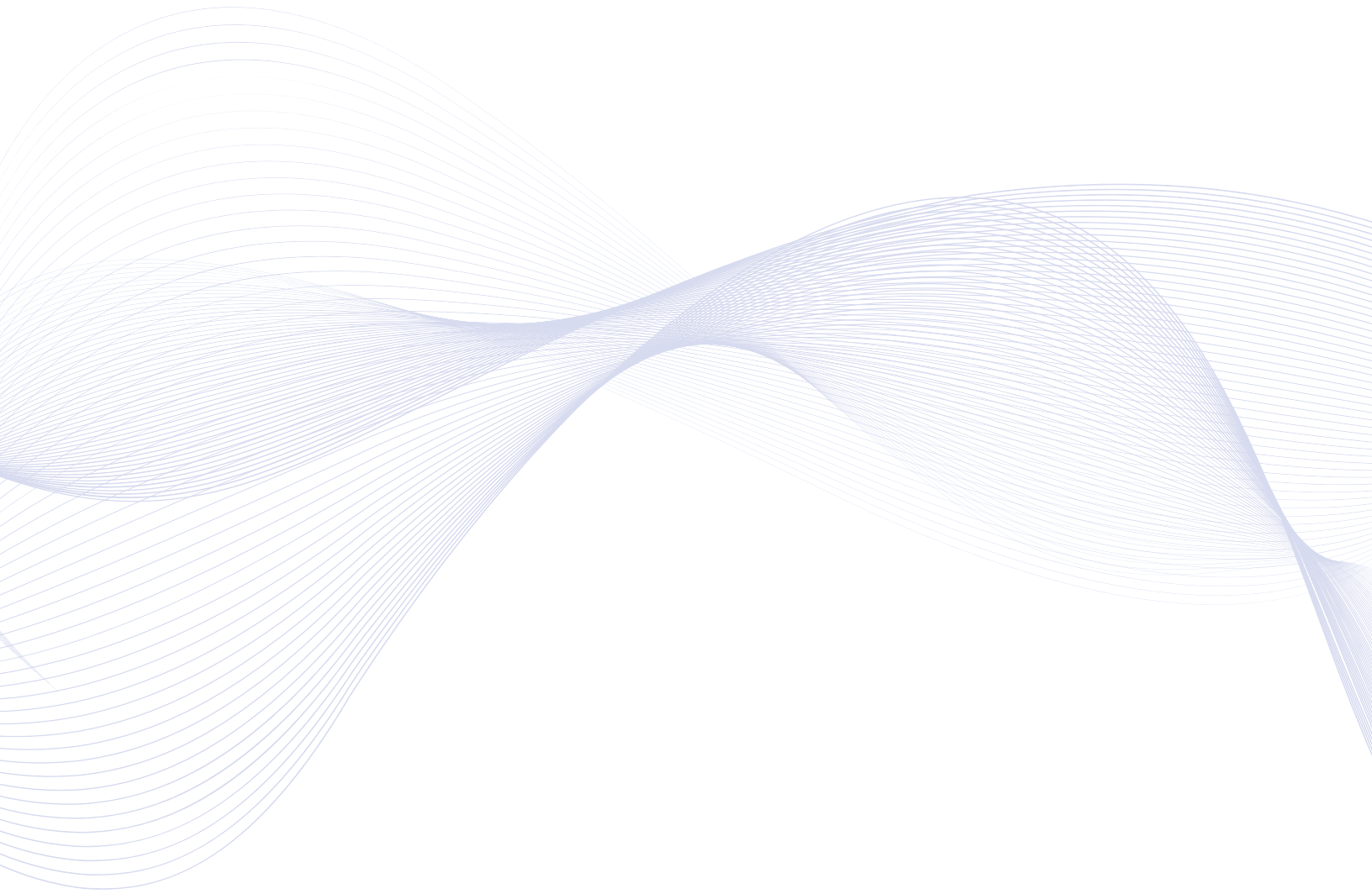
DECORATION AND PAINT

The GAREN sheets may be painted and decorated with the same paints, techniques and equipment normally used with other acrylic sheets.

The paints to be used must not contain solvents that attack the surface of the sheet.

Paints should be of excellent quality and environmental resistance when required for outdoor applications.

When you need to paint the piece before forming it you should consider that the paint has sufficient elasticity to take the shape of the piece



GAREN