TECHNICAL INFORMATION

BARLO PS

ENGLISH

Contents

TECHNICAL INFORMATION

BARLO PS
ENGLISH

1. Product identification

BARLO PS is the brand name for extruded Crystal Polystyrene sheets from Quinn Plastics. The BARLO PS programme offers solutions for many indoor applications.

As a result of the extrusion process, Quinn Plastics can offer, apart from the clear, the anti-reflex and the standard opal white versions, a variety of colours and designs.

2. Characteristics

BARLO PS sheets have good optical properties and a brilliant surface. The BARLO PS range contains sheets that are easy to fabricate, to vacuum form, and show a high light transmission (min 88% wavelength: 500 nm, thickness 3 mm).
Important benefits of BARLO PS sheets are their low price, low density (1.05), good chemical resistance and high rigidity. As a standard BARLO PS sheets are UV-stabilised and remain colour constant for many years when used indoors.

On special request BARLO PS sheets can be produced without UV-stabilisation. They then meet all current food contact legislation and can be used in contact with foodstuffs.

BARLO PS sheets also combine the following excellent properties:
- Excellent transparency
- Good surface hardness
- Good recyclability
- Low water absorption

3. Applications

- Picture frames
- Shower cabin doors (flat and curved)
- Indoor glazing

4. Fabrication and finishing techniques

BARLO PS sheets are easy to handle. Quinn Plastics offers a whole range of fabrication activities such as sawing, curving, drilling, etc. Contact your sales office for more information.
BARLO PS sheets can be machined using all the usual methods, such as sawing, milling, drilling, turning, grinding, polishing and thermoforming. More detailed information on these items can be found in the "USER GUIDE", further in this brochure.

5. Statements

5.1. Food approval statement

On request BARLO PS sheets can be produced without UV-stabilisation and they then can be used in contact with foodstuffs. Therefore, in applications where covers for foodstuffs or fittings for shops etc. are needed, BARLO PS Food Grade can offer a good solution.

BARLO PS food grade sheets are clear transparent extruded crystal Polystyrene sheets which are produced from raw materials which meet the compositional requirements of FDA (21 CFR 177.1640), BGA (recommendation V), EEC (89/109 and 90/128) and the various national regulations in European countries.

It is the responsibility of the end user to satisfy himself that the product is fit for purpose and meets the required migrational requirements for his application.

5.2. Safety data statement

This statement indicates all safety rules, to be taken into account when using BARLO PS sheets.

Composition/information on ingredients
- Chemical nature Polystyrene sheet
- Hazardous ingredients none known

Possible hazards none known

First aid measures
If inhaled:
- On inhalation of decomposition products: keep patient calm, remove to fresh air and request medical help (if required)
- On skin contact: areas affected by molten material should be quickly placed under cold running water
- On contact with eyes: wash affected eyes for at least 15 minutes under running water with eyelids held open
- On ingestion: no special measures necessary

Note to physician:
- On inhalation of decomposition products: treat according to symptoms (decontamination, vital functions), no known specific antidote.

Fire fighting measures
- Suitable extinguishing media: water, dry extinguishing media, foam
- Unsuitable extinguishing media for safety reasons: none
- The following can be given off in a fire: carbon dioxide (CO_2) and steam. In addition small quantities of the following substances can be formed: carbon monoxide, monomers, other degradation products
- Special protective equipment: in case of fire, wear a self contained breathing apparatus

Further information: dispose of fire debris and contaminated extinguishing water in accordance with local regulations

Accidental release measures
- Methods for cleaning up: sweep / shovel up

Handling and storage

Handling:

- Gaseous products of degradation can be given off if the product is greatly overheated: monomers, other degradation products
- Avoid inhalation of vapour
- Processing machines must be fitted with local exhaust ventilation
- Protection against fire and explosion: no special measures necessary

Storage: Keep in a dry place

Exposure controls and personal protection

- Personal protective equipment
- Normal handling: eye protection
- Thermal processing: gloves, eye and / or a face protection

Physical and chemical properties

- Form: solid sheet
- Colour: clear, opal, coloured or translucent
- Change in physical state:
- Softening point: > 70°C ISO 306
- Ignition temperature: > 400°C DIN 51794
- Density: 1.02-1.06 g/cm² ISO 1183
- Solubility in water: insoluble
- Solubility in other solvents: soluble in aromatic solvents

Stability and reactivity

- Conditions to avoid: to avoid thermal decomposition, do not overheat
- Starts to decompose at temperatures > 270°C
- Possible thermal degradation products: monomers, other degradation products

Toxicological information

Effects of exposure:

- Inhalation: low hazard for usual industrial handling or commercial handling by trained personnel
- Eyes: same as above
- Skin: molten material may cause thermal burns
- Ingestion: expected to be a low ingestion hazard

Ecological information

- Extremely low water solubility. Low volatility
- No environmental hazards known

Disposal considerations

- Must be disposed of or incinerated in accordance with local regulations

Transport information

- Not classified as hazardous under transport regulations

Regulatory information

- Labelling according to EEC Directives: not subject to labelling

Other information

- The information contained herein is based on the present state of our knowledge and does not therefore guarantee certain properties.
- Recipients of our product must take responsibility for observing existing laws and regulations.

5.3. Statement on thermal insulation

BARLO PS sheets used in indoor glazing applications results in considerable energy cost savings by preventing excessive heat loss in winter and blocking heat entry in the summer. The heat loss factor, normally referred to as the K-value, of BARLO PS is significantly lower than for glass at the same thickness. Some examples of the heat insulation performance of BARLO PS in single and double glazing systems are given below and compared with glass.

Advantages of BARLO PS to glass

■ **At the same thickness:**
- ➢ Improvement of the K-value
- ➢ Weight saving

Single glazing:
- Improvement K-value:
  glass 5 mm: K-value = 5.74 W/m²°C
  BARLO PS 5 mm: K-value = 5.01 W/m²°C
  Δ = 0.73 W/m²°C = 12.7%
- Weight saving:
  glass 5 mm: 12.5 kg/m²
  BARLO PS 5 mm: 5.25 kg/m²
  Δ = 7.25 kg = 58%

Double glazing:
- Improvement K-value:
  2 x glass 4 mm with air gap 5 mm: K-value = 3.57 W/m²°C
  2 x BARLO PS 4 mm with air gap 5 mm: K-value = 3.15 W/m²°C
  Δ = 0.42 W/m²°C = 11.8%
- Weight saving:
  2 x glass 4 mm: 20 kg/m²
  2 x BARLO PS 4 mm: 8.4 kg/m²
  Δ = 11.6 kg/m² = 58%

■ **At the same K-value:**
- ➢ Weight saving
- ➢ Volume saving

Single glazing:
glass 10 mm: K-value = 5.60 W/m²°C
BARLO PS 2 mm: K-value = 5.50 W/m²°C
- Weight saving:
  glass 10 mm: 25.0 kg/m²
  BARLO PS 2 mm: 2.10 kg/m²
  Δ = 22.9 kg/m² = 91.6%
- Volume saving:
  Δ = 8 mm

Double glazing:

2 x glass 5 mm with 15 mm air: K-value = 3.05 W/m²°C
2 x BARLO PS 3 mm with 10 mm air: K-value = 2.99 W/m²°C

- Weight saving:
  glass 2 x 5 mm: 25.0 kg/m²
  BARLO PS 2 x 3 mm: 6.3 kg/m²
  Δ = 18.7 kg/m² = 74.8%
- Volume saving:
  glass 2 x 5 + 15: 25 mm
  BARLO PS 2 x 3 + 10: 16 mm
  Δ = 9 mm

K-values for customer specific glazing systems can be provided upon request. For more information contact one of the sales offices of Quinn Plastics.

6. Technical information

6.1. Technical data sheet

■ GENERAL			
Property	**Method**	**Units**	**BARLO PS**
Density	ISO 1183	g/cm³	1,05
Rockwell Hardness	ISO 2039-1	M scale	150
■ OPTICAL			
Property	**Method**	**Units**	**BARLO PS**
Light Transmission	DIN 5036-3	%	89
Refractive Index	ISO 489	n^{D}_{20}	1.59
■ MECHANICAL			
Property	**Method**	**Units**	**BARLO PS**
Flexural Modulus	ISO 178	MPa	3450
Flexural Strength	ISO 178	MPa	85
Tensile Modulus	ISO 527-2	MPa	3400
Tensile Strength	ISO 527-2	MPa	45
Elongation	ISO 527-2	%	3
■ THERMAL			
Property	**Method**	**Units**	**BARLO PS**
Vicat Temp. (VST/B 50)	ISO 306	°C	101
Heat Deflection Temp. (A)	ISO 75-2	°C	86
Specific Heat Capacity	ASTM D-2766	J/gK	1.8
Coefficient of linear thermal expansion	DIN 53752	$K^{-1}x10^{-5}$	8
Thermal conductivity	DIN 52612	W/mK	0.16
Degradation temperature		°C	> 280
Max service temperature		°C	80
Sheet forming temp. range		°C	130-170
■ IMPACT STRENGTHS			
Property	**Method**	**Units**	**BARLO PS**
Charpy (notched)	ISO 179-1	kJ/m²	-
Charpy (unnotched)	ISO 179-1	kJ/m²	6
■ ELECTRICAL			
Property	**Method**	**Units**	**BARLO PS**
Volume Resistivity	DIN 53482	Ω.cm	$> 10^{14}$
Surface Resistivity	DIN 53482	Ω	$> 10^{14}$

Chemical resistance at 20°C

Acetone	-	Glycols	+
Acids (weak soln)	+	Glycerine	+
Alcohols		Hexane	+
Ethyl	+	Methylenechloride	-
Isopropyl	+	Methylethylketone	-
Methyl	+	Mineral Oil	+
Ammonia (weak soln)	+	Paraffin	+
Benzene	-	Toluene	-
Carbon tetrachloride	-	Sodium Chloride (aq)	+
Chloroform	-	Sodium Hydroxide (aq)	+
Ethyl Acetate	-		

– = Attacked
+ = Not attacked

6.2. Product range BARLO PS

6.2.1. BARLO PS flat sheets

BARLO PS flat sheets are laminated on both sides with a PE-film.

Thickness Range
From 0.9 mm up to 6 mm
Standard thicknesses for flat clear sheets are: 1-1.5-2-2.25-2.5-3-4-4.75 mm

Widths cut-on-line

Max 1250 mm	for 0.9 mm and 1.5 mm
Max 2000 mm	for 1.5 mm up to 6 mm

Lengths cut-on-line

Min	1000 mm
Standard length	3050 mm

Thickness tolerances (at 20°C)

≤ 2.5 mm	± 10 %
> 2.5 mm	± 5 %

Cut-on-line tolerances (at 20°C)

< 1000 mm	± 1.5 mm
1001 to 2000 mm	-0/+6 mm
>2000 mm	-0/+9 mm

Cut-to-size tolerances (at 20°C)
± 1.00 mm

Minimum production runs for

Special thickness	2.000 kg
Special pattern	5.000 kg
Special colour	5.000 kg

Other thicknesses, sizes and tolerances on request. For the standard stock programme see our product overview brochure.

6.2.2. BARLO PS patterned sheets

BARLO PS patterned sheets are laminated only on the smooth side with a PE-film.

Thickness Range
From 1.5 mm up to 6 mm
Standard thicknesses for patterned sheets are: 2.5 and 5 mm

Widths cut-on-line

Max 1250 mm	for t < 2.0 mm
Max 1500 mm	for 2.0 ≤ t ≤ 2.2 mm
Max 2000 mm	for t > 2.2 mm

Lengths cut-on-line

Min	1000 mm
Max	3500 mm
Standard length	2000 mm

Thickness tolerances (at 20°C)
+/- 0.1mm
Thickness tolerances for patterns are to be measured on highest point of pattern

Cut-on-line tolerances (at 20°C)
± 1.5 mm

Cut-to-size tolerances (at 20°C)
± 1.00 mm

Minimum production runs for

Special thickness	2.000 kg
Special pattern	5.000 kg (1.000 kg/thickness)
Special colour	5.000 kg (1.000 kg/thickness)

Other thicknesses, sizes and tolerances on request. For the standard stock programme see our product overview brochure.

7. User guide

7.1. Introduction

The manufacture of plastic articles from BARLO PS sheet normally involves secondary fabrication operations, including sawing, drilling, bending, decorating, and assembling. This guide covers the properties and characteristics of BARLO PS that need to be taken into account if secondary operations are to be performed successfully.

7.2. Fabricating

7.2.1. Machining guidelines

BARLO PS sheet can be worked with most tools used for machining wood or metal. Tool speeds should be such that the sheet does not melt from frictional heat. In general, the highest speed at which overheating of the tool or plastic does not occur will give the best results.
It is important to keep cutting tools sharp at all times. Hard, wear-resistant tools with greater cutting clearances than those used for cutting metal are suggested. High-speed or carbon-tipped tools are efficient for long runs and provide accuracy and uniformity of finish.
Since plastics are poor heat conductors, the heat generated by machining operations must be absorbed by the tool or carried away by coolant. A jet of air directed on the cutting edge aids in cooling the tool and in removing chips.
Plain water or soapy water is sometimes used for cooling unless the trim scrap is to be reused.

7.2.2. Milling

Sheet manufactured from BARLO PS can be machined with standard high-speed milling cutters for metal, provided they have sharp edges and adequate clearance at the heel.

7.2.3. Drilling

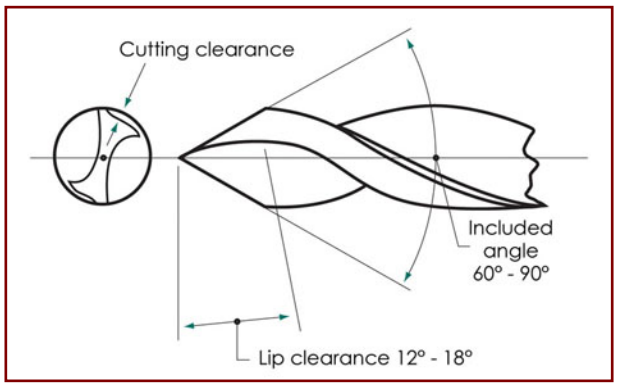

Figure 1
Suggested drill-point design for drilling plastic sheet

Drills designed especially for plastics are available, and their use is suggested. Standard twist drills for wood or metal can be used; however they require slower speeds and feed rates to produce a clean hole. Twist drills for plastics should have 2 flutes, a point with an included angle of 60° to 90°, and a lip clearance of 12° to 18°, as shown in figure 1.
Wide, highly polished flutes are desirable since they expel the chips with low friction and thus tend to avoid overheating and consequent gumming. Drills should be backed out often to free chips, especially when drilling deep holes. Peripheral speeds of twist drills for plastics ordinarily range from 30 to 61 m per minute. The rate of drill feed into the plastic sheet generally varies from 0.25 to 0.63 mm per revolution.

NOTE:
When drilling, be sure to hold or clamp the part securely to prevent it from cracking or slipping and presenting a safety hazard to the operator.

7.2.4. Sawing

Following types of sawing operations can be used to saw thermoplastic materials: band saw, circular saw and jigsaw as well as hand operated saws.
It is recommended that new or well-sharpened tools are used. At very high cutting speeds, the saw blade should be cooled with water or an alternative appropriate cooling emulsion.

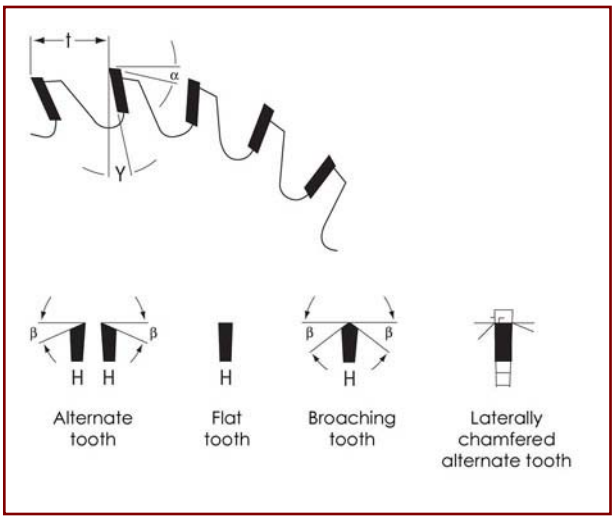

Figure 2
Example of Sawblades

Type of sawing	Band saw	Circular saw
Tooth distance	sheet thickness below 3 mm, 1 to 2 mm	8 to 12 mm
	sheet thickness 3 to 12 mm, 2 to 3 mm	8 to 12 mm
Clearance angle a	30 to 40°	15°
Rake angle ψ	15°	10°
Tooth angle β	-	15°
Cutting speed	1200 - 1700 m/min	2500 - 4000 m/min
Feed speed	-	30 m/min

Table 1
Sawing recommendations

7.2.5. Routing

Routers with sharp two-flute straight cutters produce very smooth edges. They are useful for trimming the edges of flat or formed parts, particularly when the part is too large or irregular in shape for a band saw. Portable, overarm, and under-the-table routers work equally well. The plastic sheet should be fed to the router slowly to avoid excessive frictional heating and shattering. The router or plastic sheet, whichever is moving, must be guided with a suitable jig. Compressed air can be used during the routing operation to cool the bit and aid in chip removal.

7.3. Forming

7.3.1. Thermoforming

There are a number of different thermoforming techniques that can, under well-controlled conditions, be used to form BARLO PS sheet, once heated, into the shape of a mould by mechanical, air pressure, or vacuum forces. Both male (plug) and female (cavity) moulds are used. Tooling can range from low cost plaster moulds to expensive water cooled steel moulds but cast aluminium is more commonly used. Other materials including wood, gypsum, and epoxy can also be used. Forming processes to be discussed include straight vacuum, drape, matched mould, pressure-bubble plug-assist, plug-assist pressure, vacuum snap-back, pressure-bubble vacuum snap-back, trapped-sheet contact-pressure, free, and mechanical. In the event that during the heating up of BARLO PS small bubbles appear, this is due to the fact that the sheets have absorbed moisture during storage. In this case, the sheets must be pre dried before they are worked on.

7.3.2. Straight vacuum forming

Vacuum forming is the most versatile and widely used forming process. The equipment costs less and is simpler to operate than most pressure or mechanical techniques. In straight vacuum forming, BARLO PS is clamped in a frame and heated. When the hot sheet is in an elastic state, it is placed over the female mould cavity. The air is then removed from the cavity by vacuum and atmospheric pressure then forces the hot sheet against the contours of the mould. When the BARLO PS sheet has cooled sufficiently, the formed part can be removed. Thinning at the upper edges of the part usually occurs with relatively deep moulds. The hot sheet being drawn to the centre of the mould first causes thinning. Sheeting at the edges of the mould must stretch the most and thus becomes the thinnest portion of the formed item. Straight vacuum forming is normally limited to simple, shallow designs.
See figure 3

7.3.3. Drape forming

Drape forming is similar to straight vacuum forming except that after the BARLO PS sheet is framed and heated, it is mechanically stretched, and a pressure differential is then applied to form the sheet over a male mould. In this case, however, the sheet touching the mould is close to its original thickness. It is possible to drape-form items with a depth-to-diameter ratio of approx. 4 to 1; however, the technique is more complex than straight vacuum forming. Male moulds are easier to build and generally cost less than female moulds; however, male moulds are more easily damaged. Drape forming can also be used with gravitational force alone. For multi-cavity forming, female moulds are preferred because they do not require as much spacing as male moulds.
See figure 4

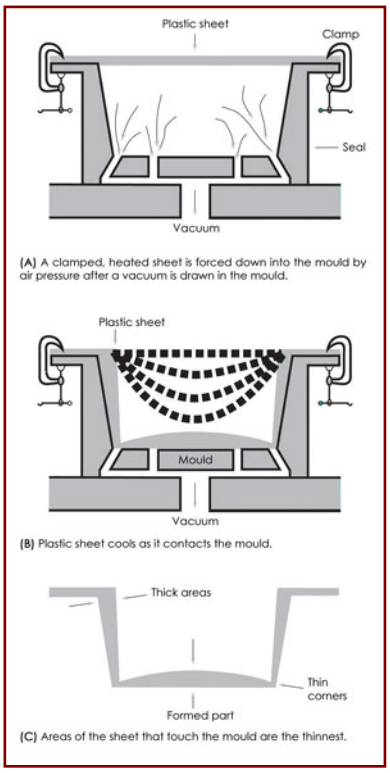

Figure 3
Straight vacuum forming

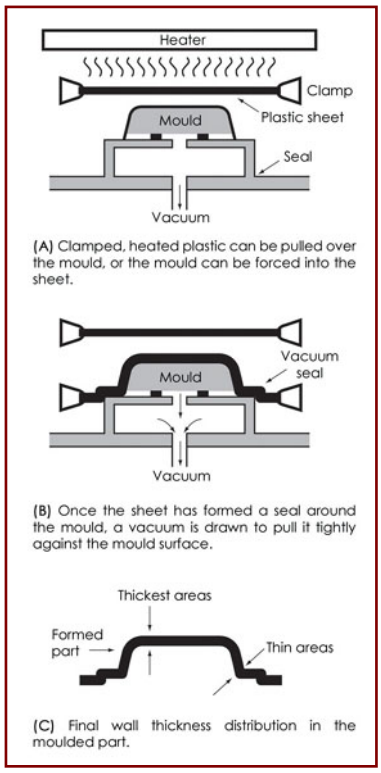

Figure 4
Drape forming

7.3.4. Matched-mould forming

Matched-mould forming is similar to compression moulding in that heated BARLO PS sheet is trapped between male and female dies made of wood, plaster, epoxy or some other material.
Although they cost more, water-cooled matched moulds produce more accurate parts with close tolerances.

7.3.5. Pressure-bubble plug-assist vacuum forming

The pressure-bubble plug-assist vacuum forming technique can be used when BARLO PS sheet is to be formed into deep articles that must have good thickness uniformity. The sheet is placed in a frame and heated, and controlled air pressure is used to create a bubble. When the bubble has been stretched to a predetermined height, the male plug-assist (normally heated) is lowered to force the stretched sheet into the cavity. Plug speed and shape can be varied for improved material distribution; however, the plug is made as large as possible so that the plastic material is stretched close to the shape of the finished product. The plug should penetrate 75 to 85% of the mould cavity depth. Air pressure is then applied from the plug side while a vacuum assist is being drawn on the cavity. The female mould must be vented to allow the escape of trapped air.

7.3.6. Plug-assist pressure forming

Plug-assist pressure forming is similar to plug-assist vacuum forming in that a plug forces the hot BARLO PS sheet into a female cavity. Air pressure applied from the plug then forces the plastic sheet against the walls of the mould. Plug design and plug speed can be varied to optimize material distribution.

7.3.7. Plug-assist vacuum forming

Corner or periphery thinning of cup- or box-shaped articles can be prevented by use of a plug-assist to mechanically stretch and pull additional plastic material into the female cavity. The plug should be 10 to 20% smaller than the mould and should be heated to just under the forming temperature of the sheet. Once the plug has forced the hot sheet into the mould cavity, air is drawn from the mould to form the part.
Plug-assist vacuum forming and plug-assist pressure forming (see previous section) allow deep drawing and permit shorter cooling cycles and good wall thickness control. Both processes require close temperature control and are more complex than straight vacuum forming.

7.3.8. Free forming

In free forming, air pressures of about 2.76 MPa can be used to blow a hot BARLO PS sheet through the silhouette of a female mould. Air pressure causes the sheet to form a smooth bubble-shaped article such as used in skylight panels or window well covers. Since only air touches each side of the pad, there will be no mark-off unless a stop is used to form a special contour in the bubble.
See figure 5

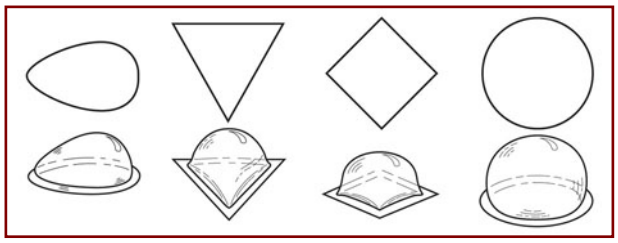

Figure 5
Examples of free-form shapes that can be obtained with openings

7.4. Assembly

BARLO PS sheet can be fabricated into a variety of shapes and articles with solvent, cement (a polymer dissolved in a solvent), or adhesive bonds. In general, when the surfaces to be joined are irregular, a cement is preferred over a solvent.
Solvents and cements are not the best choice when bonding BARLO PS sheet to other thermoplastics. Adhesives, including cyanoacrylates, two-part acrylics and hot melts, are more effective when bonding BARLO PS to dissimilar plastics and can be used to bond BARLO PS to itself.

7.4.1. Assembly guidelines

The following guidelines should be observed when bonding BARLO PS sheeting:

- The sheet edges must be clean and free from contamination.
- The surfaces must be smooth and accurately aligned.
- A solvent or cement must be sufficiently active to soften the mating surfaces for some flow to occur when pressure is applied.
- When using solvents in BARLO PS sheet assembly, it is advisable that the work area be climate controlled with low humidity to minimise joint 'whitening'. If this is not possible, the addition of 10% glacial acetic acid to the solvent or use of a slower curing cement-type bond is suggested.
- Fixture pressure must be maintained to prevent movement of the joint until it is solid.
- Good ventilation is required when working with solvents. Exposure levels must be controlled according to OSHA guidelines.

7.4.2. Bonding techniques: solvents, cements and adhesives

Small articles with flat surfaces can be joined by placing the pieces together and applying the appropriate bonding agent (solvent, cement, or adhesive). Care should be taken to ensure that the joints are uniformly coated; a solvent can be effectively applied with a needle applicator. The assembly should be clamped into position until the bond is set. When larger articles are to be solvent bonded, it is best to immerse the joining surfaces in a solvent bath until the material is softened and then clamp them into position until the bond has set. A constant level of solvent immersion should be maintained in a shallow pan with a support pad, screens, and other means to ensure part-to-part uniformity.
Several solvents, cements, and adhesives provide strong bonds with good clarity when used in BARLO PS sheeting fabrication operations:

Material	Bond Type
Methyl Ethyl Ketone (MEK)	Solvent
Methylene Chloride	Solvent
Mixture of PS in a 50/50 mixture toluene/MEK (300 g PS/1000 g mixture)	Solvent
Super Glue Cyanoacrylate	Adhesive

7.4.3. Mechanical fastening

BARLO PS sheet can be fabricated with mechanical fasteners into attractive joints.
The diameter of the holes should be oversized to allow movement of the assembly caused by thermal expansion. Screws and rivets provide permanent assembly. Standard nuts, bolts, and machine screws are used in many instances, in addition, special screws and rivets specially designed for use with plastics are available. Springs, clips, and nuts are low cost, rapid, mechanical fasteners. Hinges, knobs, catches and dowels are some other devices used in mechanical assemblies.

7.5. Finishing

7.5.1. Sanding

BARLO PS sheet is best sanded wet to avoid the frictional heat build-up that is characteristic of dry sanding techniques. If water coolants are used, the abrasive lasts longer and the cutting action increased. Progressively finer abrasives are used: for example, rough sanding with 80-grit silicon-carbide would be followed by finer sanding with 280-grit silicon-carbide, wet or dry. The final sanding may be with 400 or 600-grit sandpaper. After the sanding is finished and the abrasives removed, additional finishing operations may be required.

7.5.2. Joining

A standard woodworking jointer-planer will produce an accurately aligned and good quality finished edge on BARLO PS sheeting. Carbide or high speed blades, which have a longer life, will provide a uniform finish as well.

7.5.3. Filing

When many thermoplastics, including BARLO PS, are filed, a light powder that tends to clog some files is produced. Therefore, aluminium Type A, shear-tooth, or other files that have coarse, single-cut teeth with an angle of 45° are preferred.

7.5.4. Solvent polishing

The appearance of saw-cut edges can be improved by first sanding and then solvent polishing with MEK or methylene dichloride. It may be necessary to add a slow drying component such as diacetone alcohol to prevent humidity blush after drying.

NOTE:
When using solvents, proper ventilation of the area is essential. Follow all precautions listed on the Material Safety Data sheet supplied with the solvent being used.

7.5.5. Printing

BARLO PS sheeting can be printed with conventional equipment; however, the ink does not penetrate a plastic as it does with paper and cloth and is therefore subject to damage by abrasion. This can be minimised by applying a light coat of clear lacquer over the printing.
There are a number of different methods used when printing on plastics including letterpress, letterflex, dry offset, offset lithography, rotogravure, stencilling, and a commonly used silk screen process. In silk screening, the ink is spread on a fine metallic or fabric screen onto the product, and a squeegee is used to force the ink through the screen on the sheet.
Since each application may require a different type of ink, it is suggested that an ink manufacturer be consulted for recommendations.

7.6. Vertical glazing

In order to determine the required dimensions for BARLO PS sheets, fixed on all sides, the following factors are to be taken into consideration:

- Coefficient of thermal expansion
  80 x 10^{-6} corresponding to 0.08 mm per m length and a 1°C change of temperature.

- Inside width of the frame
  The frames can be made of plastic, wood or metal. It is highly recommended that the frame rebate consist of relatively dense material. For a defined edge length, the frame must be larger and this according to the amounts indicated below:

Edge length	Addition
500 mm	3.0 mm
1000 mm	5.0 mm
1500 mm	7.0 mm
2000 mm	10.0 mm
3000 mm	15.0 mm

- Depth of rebate
  The rebate should be approx. 25 mm deep.

- Length/width ratio
  The figures take a length/width ratio of 1:1.5 up to 1: 3 into account.

Important when glazing with BARLO PS sheets:
- Care is to be taken when installing for adequate free space due to thermal expansion.
- The edging tape must not stick to the BARLO PS sheets. Unplasticised rubber and plastic profiles can be used for the edging tape.
- The sealing medium must have permanent elasticity, suitable materials being polysulfides and silicon rubbers in a neutral position.

7.7. Curving capabilities

- All curves with radius between 450 mm and 570 mm
- Maximum sheet height: 1950 mm
- Maximum sheet width: 1000 mm
- Maximum sheet thickness: 5 mm
- Minimum sheet thickness: 2 mm
- Tolerances on Radius: ± 15 mm
  Length + width: ± 1 mm/m

OTHERS:
Other materials, shapes, radius, thickness and dimensions must be tested prior to ordering.

NOTE:
Two control tools for the radius (i.e. a curved profile where the sheet will be mounted in) must be sent to Quinn Plastics prior to the first order.