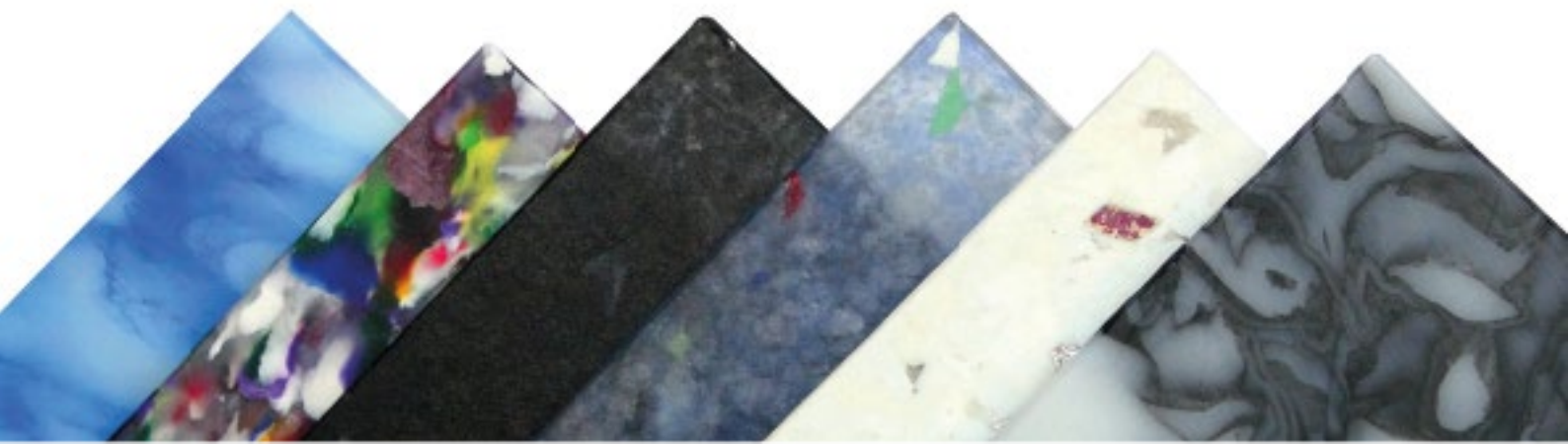


# Smile Plastics

Handling Information



# Smile Plastics

## Introduction

These guidelines set out our recommendations for storing, caring for and working with our materials. They are not exhaustive, and we are continually testing new possibilities with our materials. (You may also have success using different equipment or tools, so please send us your recommendations too.)

Our sheets of plastic share many of the characteristics of other plastics and composite wood-based boards like MDF. They can be worked with most woodworking, plastics and metal tools, providing they are kept sharp. The biggest problem is frictional heat, which causes the plastic (especially swarf) to melt.

When cutting/working the material, try to use the fastest possible machine speeds without causing the plastic to melt through a heat build up - sharp blades, fast speeds and slower feeds should result in a neat, clean cut.

We recommend experimenting on site to get the best results with your equipment, and if you are unsure please do not hesitate to ask us.

Note we have CNC machines and have recently started offering a cutting and finishing service. Contact us to discuss your requirements.

We may also be able to take back your offcuts and any end-of-life Smile Plastics materials.

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# Smile Plastics

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# Smile Plastics

## Caution!

- Plastics are flammable and can give off toxic fumes when burned. They also may deform with strong heat. As with any plastic-based material, do not use Smile Plastics products close to a naked flame or in any area where there is a high fire risk
- Our materials are not suitable for cladding buildings
- Do not use as a structural material
- Our materials (except dapple) are not recommended for food contact applications
- Clean product prior to use
- When cutting, use appropriate protective equipment including eye protection and an appropriate face mask
- Review our indicative data sheets prior to use

## Storage

If possible, store your plastic sheets on a fully-supported and level plane to avoid any warping. If this proves impossible, store them as close to upright as you can (with the long edge on the floor) and prop them against a wall with nothing else leaning on them.

The sheets will bend if improperly stacked. If bending occurs, then stacking them “in the opposite direction” will normally return bent sheets to their original shape.

The material will scratch if handled roughly, so care should be taken when they are being moved and stacked, especially when being laid flat on the floor or a work surface. We recommend laying a sheet of cardboard between stacked sheets, or on top of surfaces being worked on to help prevent marks.

Also ensure that the material is stored and worked in a clean environment, as sharp pieces of metal or grit are likely to mark the surface of the material.

### Sheet Weights for 2mx1m Dimensions

	HDPE (Dapple)	HIPS (Alba)	PET (Other Classics)
5mm	Not Available	15kg	18kg
12mm	29kg	30kg	35kg
20mm	48kg	50kg	58.7kg

\* Approximate weights

# Smile Plastics

## Maintenance

Smile Plastics sheets require little maintenance. Surface dirt can easily be removed using a mild detergent and warm water, but the material is relatively soft so abrasive cleaners should be used with caution.

The HIPS and PET panels are sensitive to organic solvents, especially nail varnish remover, paint stripper, etc. and some cleaning detergents like industrial catering spray.

The HIPS material may begin to yellow slightly in strong sunlight but this surface effect can be mostly be removed with conventional bathroom cleaners or light sanding.

Scratches on PET and HIPS can be sanded out using appropriate grades of paper and scotch pads. HDPE can be refinished using flames or scotch pads. Avoid using squeegees or dry cloths on the materials as they may create scratches by dragging debris across the surface.

Alba (HIPS) has paper and metallic foil on the surface and this can become dislodged when rubbing the surface harshly or using abrasives.

**If your Smile Plastics material becomes very dirty, try the following fixes in order:**

- 1)** Use a neat detergent on a cloth, making sure that it is a detergent compatible with the plastic which will not damage it.
- 2)** If this fails, use a solvent such as methylated spirit, but do not leave the solvent on the surface and make sure you are in a well-ventilated area.
- 3)** If these steps do not work, use a scouring powder on a cloth, or failing that, use a fine grade scotch pad or sandpaper, using increasingly fine grades up to 2000.

# Smile Plastics

## Resistance

**Heat:** Smile Plastics sheets must not be exposed to excessive heat as this will melt and eventually burn the material. They will withstand hot water, but prolonged application of boiling water will soften the sheet and cause it to lose rigidity. On a supported horizontal surface this may not be important, but as a structural element it will suffer a rapid decrease of physical properties between 95°C and 200°C.

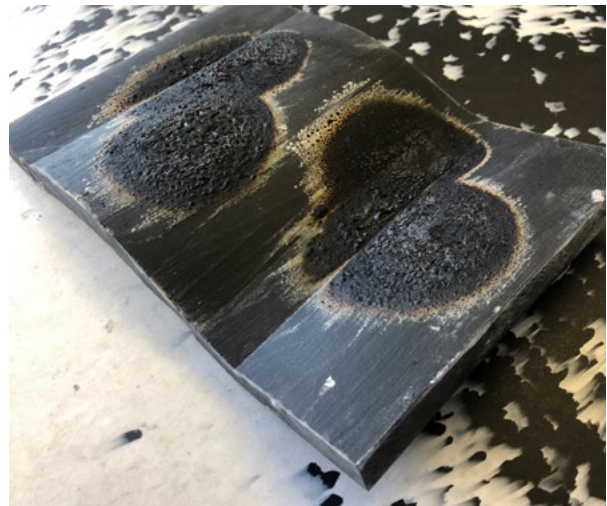
We would advise against using our materials anywhere where they would come into regular contact with high heat, for example a kitchen counter around a hob or oven.

**NOTE PLASTICS ARE FLAMMABLE AND CAN GIVE OFF TOXIC FUMES WHEN BURNED. DO NOT USE SMILE PLASTICS PRODUCTS CLOSE TO A NAKED FLAME OR WHERE THERE IS A HIGH RISK OF FIRE.**

**Solvents:** Organic solvents may cause the HDPE to swell and should be used with caution. Organic solvents **MUST NOT** be used with the HIPS or PET materials.

**Sunlight:** Sunlight will affect the HIPS sheets in two ways. Firstly, the colours may fade or yellow and secondly, the material itself will eventually become degraded and will start to lose physical properties. UV radiation will affect all our materials slightly, although it is the most obvious on Alba (HIPS)

On HIPS and PET, a hard oil with UV resistance (e.g. Osmo Oil) can be applied to the surface to add more resistance to UV damage.



Flame burned material



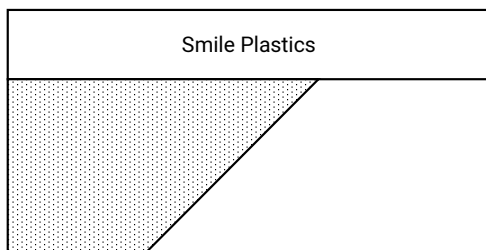
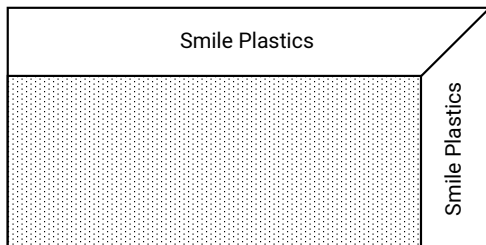
UV yellowed Alba HIPS material

# Smile Plastics

## Supporting Sheets

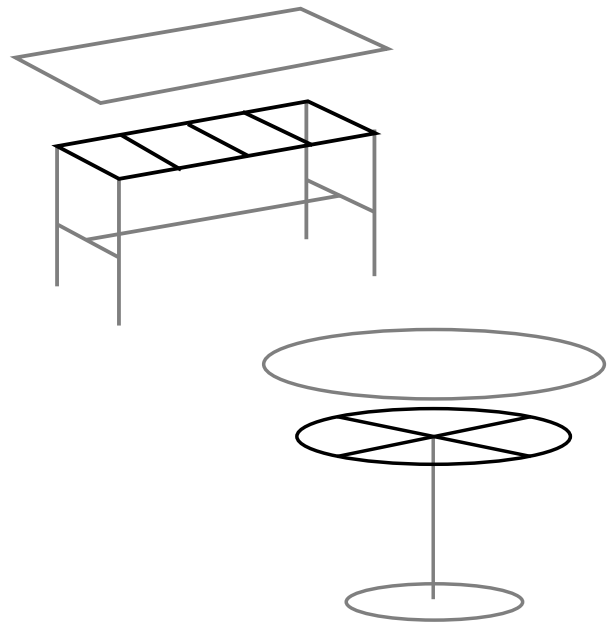
If you are planning to use the sheets for tables or work surfaces, ensure you have a sufficient supporting structure so that the material does not buckle or warp over time. This is particularly important when using 5 or 12mm sheets or the HDPE material.

We would recommend using our thickest 20mm sheets for any table top or work surface, and support it with a good substructure. If you are creating a table top which is going to receive a lot of use, we would recommend the following structures:

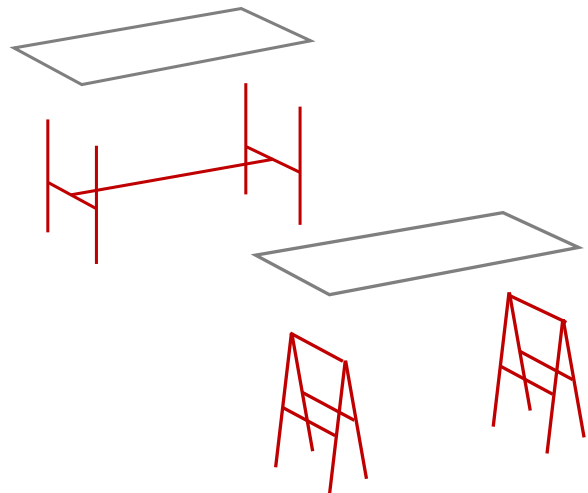


## Supporting Structures

If you are using our materials without a solid sheet support underneath, we would recommend having regular supporting beams underneath, so there are not long, unsupported spans of material.



We would strongly recommend against using table styles where the top is only supported at the four corners, or trestle-style legs without any cross beams.



# Smile Plastics

## Joining Corners

Smile Plastics materials can be used to fabricate a variety of structures and items, and the corner joining method needed may vary with the application.

Most carpentry joints will work with our materials, but a few we recommend:

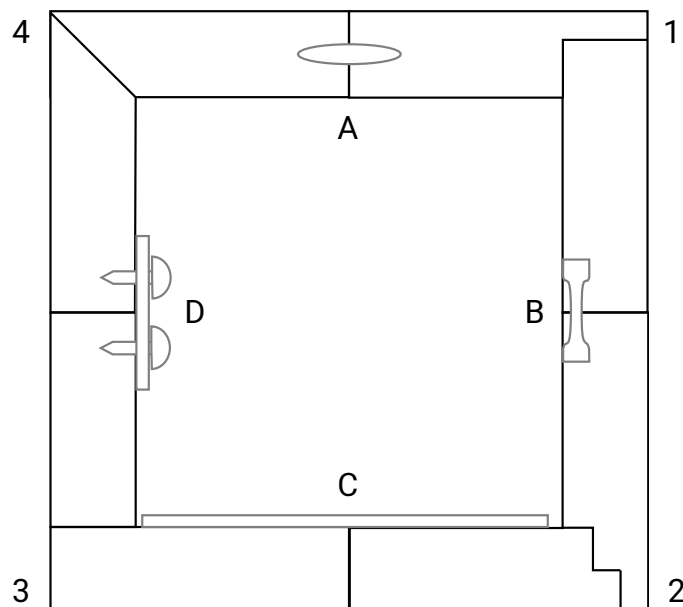
- 1 Lap joint; if a fillet or chamfer is needed on the corner this is a good option
- 2 Stepped joint; this maximises the surface that the adhesive would be applied to
- 3 Butt joint; the simplest joint if the corner does not need to be too strong
- 4 Mitred joint; if an invisible join is needed, will help give the illusion of a structure being made of one piece of material

## Joining Lengths

Smile Plastics materials can be joined to create longer runs easily and relatively seamlessly. The visual break in pattern will be more obvious with larger scale patterns like Dapple than with plainer material like Grey Mist.

Most carpentry joints will work with our materials, but a few we recommend:

- A Biscuit joint; using conventional biscuits and a screw in place. A method to create reversible, glueless joins
- B Tension bolt; using kitchen worktop tension bolts in pockets on the underside of the sheet
- C Fixing to a back plate; using a full-sheet backing plate that the material is fixed to with adhesives
- D Screw plate; using a smaller metal plate to bridge the join on the underside



# Smile Plastics

## Joining

### Fastenings

Most types of physical fastenings can be used including screws, clips, rivets and bolts, especially those recommended for MDF boards. The flexibility of the HDPE material can be exploited by incorporating snap-fit fastenings.

When screwing, try to find screws designed for plastics. We recommend using a coarse threaded stainless screw. Do not use impact drivers where possible as they can over-stress and split the plastic.

Drilled pilot holes should be slightly larger than usually needed to allow for thermal contraction and expansion and use washers to distribute the load better.

### Welding

The sheets can be edge-welded using plastics heat-welding methods. This involves a hot air gun and a 'welding' rod made from the same material. This is recommended for the HDPE materials which can be difficult to join with traditional adhesives. Only use this method if you are an experienced plastics welder.

### Sealing

Silicone sealants can be used on the PET and HIPS materials, although some surface preparation may be necessary to create a good seal. Silicone sealants do not work well on HDPE material, where a seal is needed we recommend using plastic welding to 'melt' the sheets together.

### Adhesives

Different adhesives will work for different plastic types:

#### HIPS and PET.

Most adhesive manufacturers offer products for polystyrene which are suitable for the HIPS range. A two-part epoxy should work but check your specific product first. If you want to glue the edges, some 'solvent glues/gels' such as Tensol will work. Gels will fill some voids and an oil or powder pigment can be added to make a colour matched seam. Permabond create a range of adhesives suitable for different plastic types.

#### HDPE.

Because of their surface properties, HDPE boards are difficult to glue using conventional spreading adhesives. We have had success gluing our Dapple materials with Permabond's 2-Part Structural Adhesive TA4610 which does not require pre-treatment of the surfaces. You could also consider high temperature flame treating the gluing faces of the plastic before using a two-part epoxy. Again only try this method if you are an experienced plastics fabricator.

If you do use solvent glues or other adhesives, do not let the glue sit on the finished surface as it can damage and melt the surface of the material. For any seam bonding, we recommend using masking tape to mask off the face of the panel so as to prevent surface damage.



1



2



3



4



5



6



7



8



# Smile Plastics

## Cutting

### Sawing

Most saws can be used to cut Smile Plastics boards, though fine teeth are preferred. We recommend using a wavy set or skip tooth saw to minimise friction from the face of the blade and ensure that swarf is rapidly removed.

**Circular saws** on a rail and **table saws** are effective at cutting clean straight lines through the material and will tend to give you the cleanest cut. TCT blades are preferred. The kerf width should be greater than the blade, with deep gullets, which helps reduce friction and remove swarf speedily. Perforated blades are more effective at reducing heat build up than solid blades. We recommend between 8-10,000 RPM for a circular saw.

**Reciprocating blade saws** (e.g. jig saws) can generate heat, and attention should be given to swarf removal and blade cooling, especially with the HIPS plastic. A cutting fluid will help make a good cut.

**Feed rates** should be slow and consistent enough to give a good cut, but fast enough to avoid frictional rubbing at the cutting edge. It is difficult, however, to achieve fine finishes with sawing and further hand finishing is often recommended.

We recommend securing the material when cutting it to prevent vibrational movement. Make sure you're using clamps that have soft/rubberised jaws to prevent any marking on the sheet.

You may find that passing the blade several times through the sheet at incremental depths is more effective at reducing heat build up than doing one deep pass. You could also use a vacuum or compressed air jet to remove heat and swarf at the cutting edge to prevent the swarf melting.

**We now offer a cutting service; please contact us to discuss your requirements.**



Circular saw on a rail



Table saw

# Smile Plastics

## Water-Cutting

Smile Plastics materials can be water cut. Make sure to protect the sheet from grit in the jet and the rough cutting bed to avoid surface marking/damage.



Water Cut

## Milling and Routing (e.g. CNC machining)

Milling machines and woodworking routers can be successfully used on the panels. Sharp tools and a relatively slow feed rate give the best results. To prevent chatter, care should be taken to ensure that the material is securely clamped using broad, soft-faced jaws. Use a template to guide the router/sheet, and if possible cool the bit with compressed air when routing.

For CNC cutting, we recommend using a sharp single flute upward cutter ideally with a polished face suitable for plastics.

CNC machines cope with feed rates and speeds differently. We have generally found that faster spindle speed to feed rates work better for removing medium sized chips in PET materials whilst a slower speed to feed rate is better for removing HIPS plastics. We have had success using 3 passes per 10mm cutting depth.



Routing

## Laser-Cutting

We do NOT recommend laser cutting our Classics materials, particularly Alba. If you do, make sure you cut the panels in a well-ventilated environment with good extraction, as the materials may give off noxious gasses when melted at higher temperatures.

Laser etching however can work the PET materials.



Routing

# Smile Plastics

## Drilling

Holes up to 25 mm in diameter can be made with standard tools, and trepanning tools should be used for larger holes. Drills should be kept sharp, and the drill regularly withdrawn to ensure that melting is not taking place at the point (the 'woodpecker' method). A point angle of at least 100° should be used. Special drills for plastics are available with fast helices and polished flutes. Cooling should be by air blast as a minimum, with water or emulsions being preferable. Oil based coolants should be avoided. Liquids should be washed off with water after machining. Clamp the material securely when drilling using a soft-face jawed clamp.

We do not recommend screwing directly into the material without first making a pilot hole.



These images demonstrate a drilled hole

# Smile Plastics

## Moulding

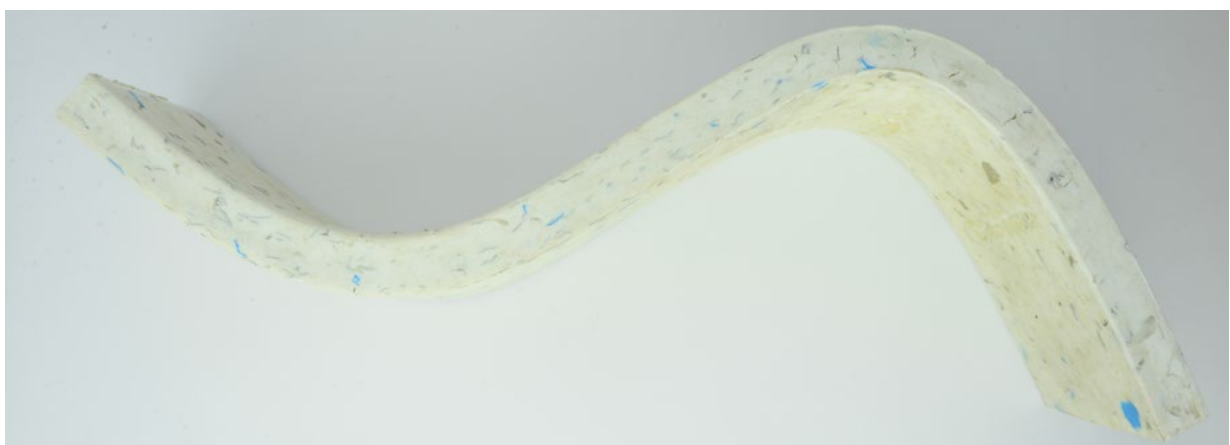
You can heat and form the material using basic sheet moulding processes. Smile Plastics boards will soften on heating, allowing them to be formed, normally between the two halves of a matched mould.

Sheets of up to 20 mm can be formed this way and drawing-down to about 3 mm is possible. Thin material up to 6 mm can be vacuum formed using conventional techniques. Most sheets are soft and easily bendable at 110°C. Flexible silicone-heated mats can be used at specific areas on the sheets to make arcs and folds, and we would recommend forming around a jig. Generally the moulding process works best when you raise the temperature of the material slowly and consistently throughout the sheet to 90-110°C before applying pressure. You may want to take your sheets to a specialist plastics moulders.

Plastics will give off toxic fumes when burned or brought up to high temperatures. Only mould if you have expertise in this area and good ventilation.

Please note that perfect cylinders are very difficult to create by thermoforming our materials, we would recommend using stacked rings to create cylinders were possible, or taking the material to a specialist.

Thicker materials may not show intricate detail when thermoforming.



Both images show heat formed moulding of two different smile plastics

# Smile Plastics

## Edge Finishing

Chamfered and straight edges can be made using table saws and rail saws, and curved edges or fillets can also be created using a router. Ensure you use sharp tools to minimise heat build up and to give you a clean edge.

The edge finish created by different cutting methods can vary. CNC cutting using the recommended bit can leave a finished and ready-to-use edge, whereas a table saw with too fast a speed can leave a very rough edge with melted swarf stuck to the surface. If a cut surface is very rough, we recommend using a very sharp blade to scrape/cut away any burrs or melted plastic, followed by sanding and polishing to create a smooth finished surface.

We would recommend using a hand deburring tool (we use a Swiss + Burr hand deburrer, pictured) to remove sharp edges cleanly and easily. The tool creates a soft, rolled edge.

**If you are ordering cut pieces from us, we do offer edge finishing and polishing on any cut pieces - please contact us to discuss your requirements**



Use a Stanley knife blade to finish off the rough edge



A deburring tool



Starting from one corner pulling the deburring tool along the edge of the plastic just as shown above.

# Smile Plastics

## Surface Finishing

Smile Plastics boards are supplied with a semi-matt press finish for all materials except Dapple, which has a planed, satin finish. Scratches and marks can be carefully sanded out using gentle pressure and a fine grade of sandpaper or scotch brite pads (fine scotch brite pads are particularly effective for light surface marking).

### Sanding

Dual action random orbital sanders are recommended, using medium pressure and fine grits. We do not recommend belt sanders as they are more likely to melt the surface. When sanding, ensure you do not stay too long in any one spot as the surface will heat up and may melt. Scotch pad style sandpaper will produce the best finishes.



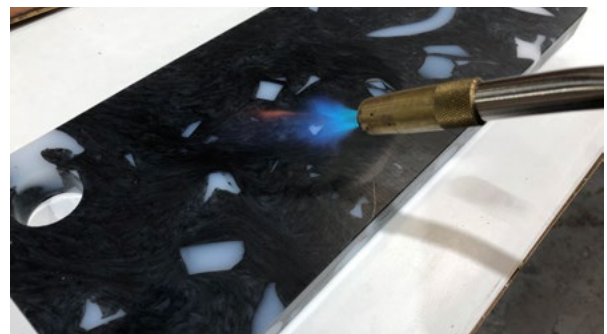
Use a scotch brite pad to remove light marking

### Flame finishing

Our materials can be flame finished using a high temperature gas torch with a fine head. Keep it approximately 3-7cm away from the surface and on the smallest flame. Ensure the flame moves constantly and does not stay too long in any one place, as this may result in burning or surface defects. Do this in a well ventilated area and take appropriate health and safety precautions. Special care must be taken when flame polishing HIPS, as it will burn easily. Only try this method out if you are an experienced plastics fabricator.

### Polishing

Use a buffing mop/wheel with a plastics-polishing compound to buff the surface to shine. The HIPS and PET materials will also take a shine with car polishing compounds.



Flame finishing dapple

# Smile Plastics

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