

# Materials That Work: *A Maker's Guide to Choosing the Right Substrate*

Acrylic or ABS? Model board or polyurethane resin? The choice of material shapes everything that follows. Here is how we think about it.

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*Material selection is one of the first decisions made on any physical production project and one of the most consequential. The wrong choice does not just affect the finished appearance. It affects how the piece is made, how long it takes, how much it costs, and how well it performs in the environment it is going into.*

Most clients do not have deep material knowledge, and they should not need to. That is what we are for. But understanding the basic logic of why one material is chosen over another helps clients make better briefs and have better conversations with their production partners.

## The questions that drive material selection

Before we suggest a material, we ask about use and environment. Is the piece being photographed, or will it be handled by the public for three months? Does it need to be rigid or can it flex? Will it be painted, or does the material colour need to be consistent throughout? Does it need to be translucent, backlit, or opaque? Is weight a consideration? Does it need to be cut, formed, printed on, or some combination of all three?

The answers to these questions narrow the field quickly. What looks like a wide choice of materials usually resolves to two or three realistic options for any given application, and often to one.

## Acrylic

Acrylic is one of the most versatile materials we work with. It laser cuts with a heat-polished edge that needs no secondary finishing. It takes paint well. It is available in clear, frosted, coloured and mirrored variants. It vacuum forms reasonably well for simpler geometries. And it has a surface quality that reads as premium in a display context.

Its limitations are brittleness under impact and a tendency to crack under drilling if not handled carefully. For anything that will be handled repeatedly or exposed to physical stress, acrylic is not the first choice. For display panels, signage, vitrines and housings where appearance matters most, it is often the best one.

## ABS and HIPS

ABS and HIPS are the workhorses of vacuum forming. Both take heat and form well, hold reasonable detail, and produce lightweight structural shells that can be painted and finished to a high standard. ABS is tougher and more impact-resistant. HIPS is slightly easier to form and cheaper, making it the preferred choice for prototype shells where cost matters and structural performance is secondary.

Neither material has the surface quality of acrylic straight off the machine, but with the right primer and finish they are indistinguishable in the final piece. For curved or compound-geometry enclosures, these materials do what acrylic cannot.

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## PETG

PETG sits between acrylic and ABS in many of its properties. It is tougher than acrylic, clearer than ABS, and forms at lower temperatures than both, which makes it useful for applications where clarity and moderate impact resistance are both required. It is increasingly common in packaging prototyping and display work where food safety or chemical resistance is a consideration.

## Model board and polyurethane foam

Model board is the material of traditional model making, and it remains the best choice for many applications because it machines beautifully, holds fine detail, and accepts paint and finish without primer. It is the right choice for presentation models, architectural scale work, and anything where surface quality matters more than structural strength.

Polyurethane foam and resin materials are used where we need to machine complex three-dimensional forms quickly. They machine fast, produce good surface quality and can be worked by hand as well as by machine. For large sculptural elements or complex geometries that would take too long to build from sheet material, these materials save significant time.

## Timber, ply and MDF

Structural builds — retail display units, exhibition structures, scenic elements — typically use timber or sheet materials as their primary structure. MDF is stable, cuts cleanly, takes paint well and is cost-effective for structural elements that will be covered or finished. Plywood is stronger and lighter, which matters for anything that needs to be moved or assembled repeatedly. Solid timber is used where grain, texture or the material itself is part of the finished appearance.

### HOW WE DECIDE

We always recommend the material that is right for the job, not the one that is easiest to work with or most familiar. Sometimes that means specifying a combination: a polyurethane foam core machined to shape, clad in vacuum-formed ABS, with acrylic facing panels and timber structural elements. The finished piece looks like one thing. It is four materials chosen for four different reasons.

## When the material is part of the design

Sometimes the material is not just a production decision but a design one. The translucency of frosted acrylic with backlighting. The warmth of a natural timber grain in an otherwise minimal display. The tactile quality of a rubberised vacuum-cast surface. In these cases the material selection is worth spending more time on, because getting it right means the piece communicates something that no amount of paint or finish could achieve.

If you are specifying a piece and you are not sure what material it should be made from, the most useful thing to do is describe what the piece needs to communicate rather than what material you think it should use. We will work backwards from the intent and tell you what makes sense.

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