THERMOFORMING vs. PHOTOPOLYMER

ORIGIN OF RAW MATERIALS

Before use by sign fabricators

A comparison between raw sheet materials for **THERMOFORMING** vs. **PHOTOPOLYMER**.

We compared materials used to create a 1/8" thick Tactile **THERMOFORMED** ADA sign (.118" Plaskolite/Optix brand clear extruded acrylic) against a 1/8" thick **PHOTOPOLYMER** ADA sign (NovAcryl/PT-118 brand clear photopolymer sheet). This comparison highlights the manufacturing steps required to create and ship an unprocessed sheet of each base material prior to starting any sign manufacturing. Environmental impacts of each raw material have not been calculated. However, follow each material lifecycle to make your own determinations.

Optix Clear Extruded Acrylic

PART 1

OPTIX .118" CLEAR GLOSS ACRYLIC SHEET extruded to 48"x96" size at PLASKOLITE FACTORY, COLUMBUS, OHIO, USA

Manufactured entirely in the **USA.**

Mechanical extrusion of PMMA resin pellet, gloss both sides with Paper or Vinyl protective liners on both sides.

Optix Clear Extruded .118" is placed on pallets and shipped to distribution outlets around the USA. Ready for purchase by Thermoformed ADA Sign Fabricators.

RAW sheet ready for thermoforming process

NovAcryl PT-118 Photopolymer

PART 1

VYVAK .118" CLEAR MATTE PETG/UV SHEET co-extruded and trimmed to 19"x25" size at PLASKOLITE FACTORY, COLUMBUS, OHIO, USA

Mechanical co-extrusion of PETG resin pellet and U/V block layer, stippled matte surface.

Pallet shipped to Bryan, Ohio for assembly. 160 Miles

PART 2

PHOTOPOLYMER LAYER for export TOYOBO FACTORY – OSAKA, JAPAN

Proprietary mechanical blending of multiple polyamide photopolymer resins for extrusion.

Mechanical co-extrusion of photosensitive gel resin to 0.034" solid photopolymer layer between two protective, removable sheets of 0.005"clear Mylar.

QC and packaged in opaque light proof vinyl bags of 10-20 sheets each, boxed, labeled, crated and shipped to Port of Osaka.

Shipped by export VESSEL from OSAKA, JAPAN to CALIFORNIA, USA then by freight to BRYAN, OHIO Total transport sea & land – 7,500 miles

PART 3

VYLON CHEMICAL ADHESIVE for export TOYOBO FACTORY – OSAKA, JAPAN

Proprietary base VYLON URETHANE liquid adhesive is manufactured, bottled and crated for export. (energy usage unknown)

Shipped by export VESSEL from OSAKA, JAPAN to CALIFORNIA, USA then by freight to BRYAN, OHIO Total transport sea & land – 7,500 miles

PART 4

NovAcryl Photopolymer Sheet is assembled at A&V FACTORY, BRYAN, OHIO

VYVAK PETG/UV is removed from pallets, protective liner over MATTE & U/V side and cleaned in preparation for VYLON Urethane liquid adhesive application.

Imported masterbatch of VYLON Urethane liquid adhesive is prepared by blending and reducing with solvents, including M.E.K. and TOULENE before being loaded into coating applicator.

VYVAK PETG/UV is fed face up into VYLON coating applicator(s) at a speed that allows for universal level coating at specified viscosity.

TOYOBO PHOTOPOLYMER LAYER is uncrated, removed from boxes and light blocking bags. One side of Mylar protective sheet is removed in preparation for mechanical laminating.

VYLON coated PETG/UV is placed on racks in properly ventilated dust-free drying rooms for 24 hours to allow for outgassing and pre-curing.

Mechanical laminator(s) are prepared by adding soft water to use as adhesive and polymer sheet activator.

VYLON coated PETG/UV sheet is fed into mechanical laminator where it is first coated with soft water activator before meeting the exposed side of TOYOBO PHOOPOLYMER LAYER and LAMINATED with minimal roller pressure to allow for polymer migration into VYLON layer.

Assembled NovAcryl PT-118 sheets are placed on drying racks to cure in climate-controlled rooms or 48-72 hours.

After curing, PT-118 sheets are placed in light blocking black bags (5 sheets p/bag) and loaded into pizza-style printed boxes and sealed.

NovAcryl PT-118 Photopolymer is placed on pallets and shipped to distribution outlets around the USA. Ready for purchase by Photopolymer ADA Sign Fabricators.

RAW sheet ready for photopolymer process

THERMOFORMING vs. PHOTOPOLYMER

PROCESS COMPARISON

Sign manufacturing

THERMOFORMING PROCESS

PART 1 — Prepare Artwork

Artwork is prepared as an Illustrator file which is then converted to a file that a CNC machine can read

PART 2 — CNC Text & Braille

7 - 10 minutes

The file is set up on a router which engraves the artwork onto a piece of 1/16" Laminate

PART 3 — Prepare Materials

1 minutes

The routed laminate is taken to the thermoforming press where it is prepped by filling the voids with a lube agent and acrylic granular. It is then laid up right into the press with the 1/8" acrylic plate paced on top. All pieces are inserted into the press with a piece of reusable sacrifice laminate material on top (like a sandwich).

PART 4 — Heat-Press Plate

3 minutes

All materials are heated to around 350˚ at 5+ tons of pressure psf. This heat and pressure melt the granular and permanently fuse it to the acrylic plate.

*Thermoforming p/ft2 requires 0.12 KWh and no other additive for disposal

PART 5 — Cool-Press Plate

3 minutes

Immediately after Heat-Press, all materials are moved to the cooling platen of the press. All materials are cooled to around 75˚ to 90˚ under 5+ tons of pressure psf. Cooling all materials under pressure eliminates warping of finished product. CNC laminate material is discarded.

*Closed loop water cooling pump, 240V 3ph

PART 6 — Finishing Touches

After cooling the plate is sent to the router to be cut to its final shape(s).

*Thermoformed parts are now ready for decorating

PHOTOPOLYMER PROCESS

PART 1 — Prepare Artwork

Artwork is prepared as an Illustrator file which is then converted to a film that a film printing machine can read.

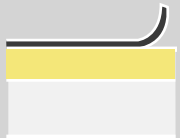
PART 2 — Print Film Negative

8 - 15 minutes

Print sign design on film negative using Epson printer.

PART 3 — Apply Film Negative

1 minute



Film negative must be aligned to raw photopolymer sheet (plate). Film Negative and NovAcryl PT-118 Photopolymer material are inserted into Orbital X Processor exposure area.

PART 4 — Expose Plate

4 - 6 minutes

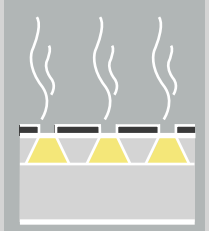


Plate and film are exposed to UV light. UV light hardens the polymer layer of the material.

* These UV bulbs contain mercury, which after prolonged exposure can cause serious damage to the central nervous system optic organ

PART 5 — Wash Plate

5 minutes

Film is removed and discarded. Plate gets moved to the washing area. Plate is washed and scrubbed in heated water. All unexposed areas of polymer layer get washed away to reveal the hardened text and braille.

* Photopolymer p/ft2 requires 0.30 KWh + 1.0 gallons of fresh water to process and stay OSHA Compliant for acceptable effluent percentage to drain into public water sewage systems

PART 6 — Dry Plate

10 - 20 minutes

Plate gets moved to a dryer area. Plate must be completely dried to stop the etching process.

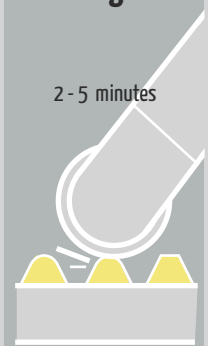
PART 7 — Expose Plate (Again)

15 minutes

Plate must be exposed to light for its final cure. This is the final step in the Orbital X Processing machine.

PART 8 — Doming Tool

2 - 5 minutes

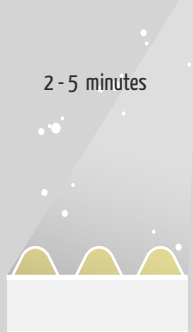


Braille must be domed with an orbital flap sander to achieve domed braille. If this step is not completed, braille will have flat tops.

* This step is REQUIRED for domed braille

PART 9 — Clear Coat

2 - 5 minutes



All raised text and braille must be painted with a UV inhibitor to prevent continued erosion, failure and discoloring.

* This step is REQUIRED to prevent failure

PART 10 — Finishing Touches

After painting, the plate is sent to the router to be cut to its final shape(s).

* Photopolymer parts are now ready for decorating.

THERMOFORMING vs. PHOTOPOLYMER

DESIGN CAPABILITIES

What thermoforming can do

LUXE ENVIROMENTS

RAW-PRESS

Clear acrylic pressed into custom shapes & sizes with ADA compliant text and grade II braille.
Designed for sign shops to apply their paint and graphics capabilities in order to meet their end user requirements with a high-quality solution.

SURE-PRESS

Single piece of clear acrylic molded under extreme heat and immense pressure combined with unlimited top-surface design and aesthetic possibilities yielding a visually stunning piece with maximum durability.

FLEX-PRESS

This revolutionary new technology enables 1/8" thick, fully-flexible ADA sign for curved wall spaces or regulated environments where rigid sign materials are detrimental. Correctional institutions & behavioral health facilities can eliminate perilous, rigid sign material utilizing FLEX-Press, ensuring a safe environment while still being code compliant.

SURFACE TEXTURES

Enrich your design with 20+ Laminate surface textures.

BETTER THAN PHOTOPOLYMER EQUIVALENT

ECO-PRESS

Created from 100% post-consumer recycled waste, these signs can be re-produced with a retro-linoleum look or a top-surface paint treatment for ADA compliant signs to achieve LEED credits.

EMBED-PRESS

Unprecedented capability to integrate textiles, grasses, feathers, organics, 3M Di-Noc, digital prints and/or virtually any element (less than 1/2" thick) embedded into an optically clear, one-piece sign.

LUMA-PRESS

Integrate photoluminescence into signs to illuminate dark stairwells and hallways. Top-surface paint and expose illuminated text and pictograms, or tip-screen copy to allow for maximum exposed illumination.

METAL-PRESS

An imperforate applied metal polymer coating over acrylic, to provide a lightweight thermoformed piece embodying all the appealing characteristics of metal.

DURA-PRESS

Made with colored or clear acrylic, choose from a variety of sub-surface design details; digitally printed logo, text, pattern and finished on the backside with paint or vinyl.

THIN-PRESS

At 1/32" or 1/16" thick, this bendable and curvy product can fit into any curved frame system or be used as a Band-Aid ADA solution.

DESIGN FEATURES

THERMOFORMING	DESIGN FEATURES	PHOTOPOLYMER
Thickness from 1/32" - 2"	Multiple Thicknesses	✓ Thickness from 1/32" - 1/2"
✓	Rounded shoulder on text and icons	✗
✓	Rounded or domed braille capabilities	✓ Only with doming tool
✓	Subsurface graphics and paint	✓ Sheet has Yellow Tint
✓	Solid one-piece monolithic construction	✗
✓	Raised text & icons thickness greater than 1/32" (up to 1/4")	✗
✓	Exterior rated for subsurface graphics	✓ Must be Clear Coated
✓	20+ surface textures available	✗
✗	Paint coat required	✓
Any extruded or cast acrylic, eco-plastic & solid surface	Multiple substrates available	✓ 2 Suppliers of RAW Sheets in the world
1/32" - 1/4"	1/32" raised text & graphics	✓
✓	No Toxic Volatile Organic Compounds (VOCs) used	✗
✓	Can be made of 100% Post-Consumer Recycled Material	✗
✓	Optically clear material	✗
✓	Can embed custom fabrics, organics & various other materials	✗
✓	Letters can't peel off with time	✗
✓	Can use integral colors for raised text & graphics	✗
✓	Can use integral color base materials (black, white or custom)	✗