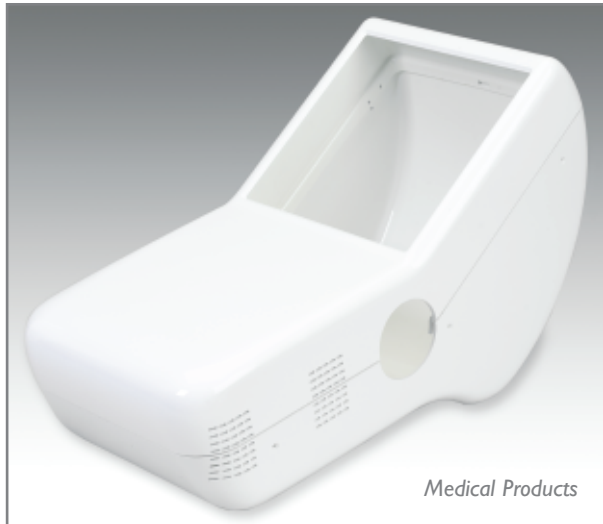




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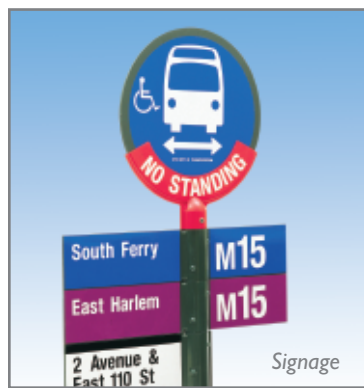
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# Heavy Gauge Thermoforming at Universal Plastics

## Terminology:

**Thermoforming** – A general term covering the process where a plastic sheet or roll is transformed into a 3-dimensional shape using heat, vacuum and pressure.

**Vacuum Forming** – This process forms the part by pulling a hot sheet of plastic against a mold using vacuum. The mold is commonly an open mold and forming force is limited to atmospheric pressure of approx. 15 psi.

**Pressure Forming** – This process adds a pressure box to the tooling package. Utilizing both vacuum and positive air pressure, the process generates 3 to 4 times the forming pressure of vacuum alone. We can form fine details that create a mold side appearance similar to that of an injection molded part, including surface textures, at a fraction of the tooling price.

**Twin Sheet Forming** – In this process there is a top and a bottom mold. Two sheets of plastic are heated in sequence and formed at the same time with a fused joint occurring around the perimeter of the molds while air pressure is injected between the upper & lower sheets. This process allows for forming hollow parts with a distinct upper and lower shape.

## Tolerance Guidelines:

These are general guidelines for tolerances on thermoformed parts, when formed on aluminum tools. Some materials such as HDPE & PP require wider tolerances due to the material properties. Tighter tolerances are available with more precise machining centers with proper fixturing.

Formed Features - +/- .030" up to 12" , add .002" per inch after 12"

Trim to Trim Features - +/- .015" up to 12" , add .001" per inch after 12"

## Equipment:

Forming Department – We have many forming machines including 5 Pressure Formers, Vacuum Formers & 3 and 4 station Rotary Thermoformers. Our maximum size is 72"x 108" with a 38" deep draw.

Secondary Operations – We are fully equipped for secondary operations including 6 CNC robotic routers with a maximum bed size of 60" x 120"

Tooling – Fully equipped in house tooling department with 2 CNC machining centers and support equipment.

Other – In house finish painting and RF/EMI Shielding. QC inspections with CMM Color conformance with a Datacolor 600.

## Common Materials:

**ABS:** (Acrylonitrile Butadiene Styrene) Very common material. Good stiffness & Impact Strength. Available in almost any color & several textures. Available in UL94-V0 grades (Flame Retardant).

**ACRYLIC:** (PMMA – Polymethyl Methacrylate, Plexiglass) Water clear and abrasion resistant material. Easily fabricated. Available in impact modified grades. Many colors available.

**HDPE:** (High Density Polyethylene) Excellent impact and chemical resistance. Good cold temperature properties. Dimensionally not as stable as other materials.

**HIPS:** (High Impact Polystyrene) Low cost, forms easily. Available in many colors. More brittle than ABS.

**KYDEX:** ( PMMA / PVC blend) Good general purpose material, offering excellent impact and chemical resistance in a highly cosmetic sheet. Most grades are flame retardant to UL94-V0. Available in many colors and textures.

**PC:** (Polycarbonate) Very high impact strength. Clear. High temperature resistance.

**PEI:** (Polyetherimide, Ultem) Very high temperature grade material. Autoclaveable. Natural amber color.

**PETG:** (Polyethylene Terephthalate Glycol) Clear, with excellent impact strength. Forms well.

**PP:** (Polypropylene) Excellent Chemical resistance. Rigid, with very good impact strength. Good at higher temperatures. But dimensionally not as stable as other materials, similar to HDPE.

**PVC:** (Polyvinyl Chloride) Rigid Material, Very good impact strength, Flame Retardant. Limited availability

**TPO:** (Thermoplastic Polyolefin) Outstanding impact properties. Available with a high gloss finish. Good for outdoors applications. More difficult to form, especially deep draw shapes.

## Design Service is Available:

If you need help with your design just let us know. Our engineers will be happy to work with you to design a thermoformed part for your specific application.